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In Defense of Nativism

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ABSTRACT: This paper takes a fresh look at the nativism-empiricism debate, presenting and defending a nativist perspective on the mind. Empiricism is often taken to be the default view both in philosophy and in cognitive science. This paper argues, on the contrary, that there should be no presumption in favor of empiricism (or nativism), but that the existing evidence suggests that nativism is the most promising framework for the scientific study of the mind. Our case on behalf of nativism has four parts. (1) We characterize nativism's core commitments relative to the contemporary debate between empiricists and nativists, (2) we present the positive case for nativism in terms of two central nativist arguments (the poverty of the stimulus argument and the argument from animals), (3) we respond to a number of influential objections to nativist theories, and (4) we explain the nativist approach to the conceptual system.

1. Introduction[1]

Nativism about the mind is regarded by many philosophers as an old-fashioned view that can be safely discarded. Among its many failings, it is said to be unscientific and theoretically lazy (in avoiding the real work of explaining where psychological capacities come from), overly intellectualist (for positing too many complex psychological processes), and excessively speculative (for its reliance on evolutionary "just so" stories).[2] Despite these (and other) charges,

[1] This article was fully collaborative; the order of the authors' names is arbitrary. EM would like to thank Canada's Social Sciences and Humanities Research Council and the Peter Wall Institute for Advanced Studies for supporting this research.

[2] For recent critiques of nativist theorizing, see Buller (2005), Cowie (1999), Elman et al. (1996), Griffiths et al. (2009), Prinz, (2002), Scholz & Pullum (2006).

we think that contemporary nativism is not at all in the sorry state that its many critics suppose. On the contrary, nativism is a robust and powerful explanatory framework for understanding the mind. Nativist research has been inordinately productive in recent years, shedding new light on such disparate psychological phenomena as our capacity to represent objects, number, time, causation, and agency, our capacity for natural language, our understanding of logic, our basic emotional states and the means to think about them, and even the psychological origins of normative reasoning.[3] Of course, a full defense of nativism would require a detailed examination of a wide range of specific psychological theories and their competitors—something we can't do here. What we propose instead is a high-level philosophical statement regarding why nativism ought to continue to occupy a central role in theorizing about the human mind.

In section 2, we argue for a reorientation in how to think about the nativism-empiricism debate. The debate should not be taken to be about whether or not there are innate psychological traits or about what it is to be innate. Rather it should be understood in terms of the focal point of the disagreement between empiricists and nativists, namely, the character of the psychological systems underlying the acquisition of psychological traits. In section 3, we present the core of the positive case for nativism, focusing on two broad arguments for nativism: the poverty of the stimulus argument and the argument from animals. In section 4, we respond to the most influential objections to nativism. We argue that none of these objections are successful. Some of the objections are based on misunderstandings of the dialectic between empiricists and nativists, some on misunderstandings of nativist theories and methods, while others stem from a naïve view of the workings of the mind. Section 5 then takes up the question of what a nativist view of the conceptual system should look like in light of the reorientation argued for in section 2. Finally, we conclude with some further remarks on the motivations behind nativism. Nativism has a long and venerable history. The intent of this paper is to convey why it is also likely to have a bright future.

[3] For a range of nativist theories, see Carruthers et al. (2005, 2006, 2007).

2. Reorienting the Nativism-Empiricism Debate

The contemporary nativism-empiricism debate is related to the historical philosophical disagreements between such figures as Locke and Lebiniz, but the contemporary debate is exclusively concerned with questions about the nature and origins of psychological traits broadly construed (mental representations, processes, mechanisms, faculties, and so on). Historically, similar concerns were intertwined with epistemological questions about justification. From a contemporary perspective, however, it is clear that justification is one thing and psychology another.[4] In principle, a belief that requires empirical justification could be innate (e.g., the belief that humans have hands), while a belief that is justified a priori might not be (e.g., the belief that arithmetic is incomplete).

But even if we stick to matters of psychology, how should we view the dispute between contemporary empiricists and nativists? It's not uncommon to hear that the dispute is over the *existence of innate psychological traits* and the *viability of the notion of innateness*. For example, in an early and influential overview, Stephen Stich remarks:

> The controversy is easy enough to summarize: Some philosophers, as well as linguists, psychologists, and others, 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*. (Stich 1975, p. 1)

However, this way of looking at the debate is deeply problematic. If nativists are committed to innate traits, so are empiricists. 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 learn things about the world around them and rocks don't. This something is typically taken to be innate, by nativists and empiricists alike. As Quine once

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[4] See Cowie (1999) for an overview and analysis of the different objectives of historical and contemporary theorists. Among contemporary theorists, the psychological orientation also includes a debate about the relation between perception and cognition, where some self-described empiricists maintain that all mental representations are perceptual-motor representations. On this view, there is no such thing as fully abstract thought. See esp. Prinz (2002). Though Prinz's empiricism is officially neutral about the status of innate concepts (pp. 195-6), it is clear that concerns about innateness are a motivating factor for proponents of his brand of empiricism.

noted, even "the behaviorist is knowingly and cheerfully up to his neck in innate mechanisms" (Quine 1976, p. 57). For this reason, the very existence of innate traits can't be what divides nativists from empiricists, nor can it be the notion of innateness.

To understand what nativism consists in, you have to see how nativism contrasts with empiricism. You have to focus on what empiricists and nativists actually disagree about. This is primarily *the character of the psychological systems that underlie the acquisition of psychological traits*. In their lifetimes, human beings come to possess a wide range of concepts and psychological abilities. We also acquire an incalculably large number of beliefs and preferences about the physical world, the social world, and even about things that don't exist (the supernatural, mythical, and fictional). The question for both nativists and empiricists is where all these psychological traits come from. In particular, what kinds of psychological systems are responsible for their acquisition?

The empiricist answer posits few distinct types of psychological mechanisms, states, and processes for acquiring psychological traits, and supposes that the same systems of acquisition operate across many psychological domains (e.g., the psychological mechanisms for learning natural language are the same as those for learning about object permanence). Empiricists explain the richness and variety of psychological outcomes in large part by reference to the environmental conditions under which development unfolds (behaviorists, for instance, would point to the patterns in differing histories of reinforcement). When empiricists do allow that there are domain-specific psychological acquisition systems, they claim that these are learned and that the learning is achieved on the basis of more fundamental domain-general psychological systems. So for empiricists, the acquisition of all psychological traits ultimately depends on only a few domain-general psychological systems whose acquisition cannot in turn be explained in psychological terms. We will refer to this modest set of psychological systems as the *Empiricist Acquisition Base*.

The nativist answer, by contrast, posits many distinct types of psychological mechanisms, states, and processes for acquiring psychological traits, and supposes that different systems of acquisition operate across different psychological domains (e.g., the psychological mechanisms for learning natural language are distinct from those for learning about object permanence). Nativists explain the richness and variety of psychological outcomes in large part by reference to the diversity of the psychological acquisition systems (many generative linguists, for instance,

take language acquisition to be dependent upon a language-specific faculty that embodies the principles of Universal Grammar). Moreover, nativists suppose that many of these systems are domain-specific systems that are not acquired on the basis of more fundamental domain-general psychological systems. So for nativists, the acquisition of all psychological traits ultimately depends not only on domain-general psychological systems, but also on a large number of domain-specific psychological systems whose acquisition cannot in turn be explained in psychological terms. We will refer to this rich set of psychological systems as the *Nativist Acquisition Base*.[5]

Certain qualifications need to be kept in mind, however. One is that there are competing hypotheses and proposals within empiricist and nativist approaches to the mind. The two should be understood as broad theoretical frameworks, not specific theories. In addition, what we have been describing are two poles on a continuum of theories. There is no sharp cutoff between the two, and theorists are welcome to embrace views that are empiricist or nativist to varying degrees.[6] It's even possible to adopt an empiricist (or nativist) perspective for certain psychological domains and the other for the remaining parts of mental life. Nonetheless, given the different motivations for nativism and empiricism, theorists typically gravitate to one or the other in explaining a broad range of psychological traits.

Putting aside the qualifications, our characterization of nativism is in terms of the explicit disagreement between nativists and empiricists regarding the types of psychological structures and processes that account for the acquisition of psychological traits.[7] One important and perhaps surprising implication of this way of thinking about nativism is that it renders nativism

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[5] Though our focus is on the contemporary dispute between empiricists and nativists, it's worth noting that the disagreement about the structures and processes underlying development is also prominent in the historical philosophical dispute. For example, Hume epitomizes the empiricist strategy in invoking just a few domain-general principles of association, and Descartes the nativist strategy in invoking distinct systems for geometrical knowledge and language. For valuable discussion of the psychological strand in historical nativist thinking and its relation to contemporary nativism, see Chomsky (2009).

[6] For these reasons, it would be more accurate to refer to Empiricist Acquisition *Bases* (which are empiricist to varying degrees) and likewise Nativist Acquisition *Bases* (which are nativist to varying degrees).

[7] Another way of stating this is to use the term *Acquisition Base* to refer neutrally to the set of psychological mechanisms, states, and processes that ultimately explain the acquisition of all traits that are acquired via psychological processes. (In saying that these mechanisms, states, and processes *ultimately* explain the acquisition of all psychological traits, we are highlighting the fact that these items and their components are not themselves acquired via psychological processes.) Given this general notion of an Acquisition Base, the dispute between nativists and empiricists turns on the character of the Acquisition Base.

perfectly compatible with learning, despite the widespread assumption to the contrary.[8] Indeed, we'd suggest that nativism is best understood as a framework for *explaining* learning, where nativists claim that learning depends on specialized systems of acquisition. For example, a nativist about face perception would hold that the learning of new faces is mediated by specialized systems that are distinct from those that underlie object perception and other types of visual identification. Or a nativist about language might hold that the learning process involves a set of domain-specific constrained choices, so that much of what occurs in learning a grammar amounts to choosing between a few alternatives, as in the theory of parameter setting. Nativist theories essentially embody proposals about the way that learning unfolds, albeit proposals that may be counterintuitive to theorists who are in the grip of contravening empiricist principles. Although we say that the compatibility of nativism and learning may be surprising to some, it isn't an idea that is particularly new to nativists. In fact, one of the foundational documents for contemporary nativism is C.R. Gallistel's aptly titled book *The Organization of Learning*. In the introduction, Gallistel announces: "My purpose is to sketch a new framework for the understanding of animal learning and the investigation of its cellular basis" (Gallistel 1990, p. 3). The framework he proposes is plainly nativist in crediting animals with specialized computational systems that underlie such things as navigating and foraging. If Gallistel is right, it's because of these sorts of systems that animals are able to learn such things as their way home from their current location and the optimal strategy for obtaining food in a given region.

Much more could be said about the nativism-empiricism dispute, but this sketch clarifies nativism's distinctive commitments. The reorientation we have argued for views nativism in terms of the types of psychological structures and processes that are needed to explain the acquisition of psychological traits. Whether nativism is the right account is another matter. We'll see in §3, however, that nativism is supported by powerful general arguments and an imposing body of evidence.

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[8] This mistaken assumption is often expressed in terms of the slogan that *learned* and *innate* are opposites. But while it is certainly very plausible that if a psychological trait is learned it can't be innate, it does not follow that learned traits are off limits for nativists. The reorientation that we are proposing (toward the character of the psychological systems involved in acquisition) opens the way for nativists to explain learning by appealing to distinctively *nativist* systems of acquisition, i.e., ones that appear in the Nativist Acquisition Base.

3. Two Key Arguments for Nativism

The most famous and widely cited argument for nativism is the poverty of the stimulus argument. Unfortunately, this argument is often misunderstood and consequently its significance has been underappreciated. The *poverty of the stimulus argument* refers to a type of argument based on the observation that the information in a learner's environment is inadequate to account for an acquired psychological trait given only general-purpose learning systems. Since the input is inadequate, the difference has to be made up somewhere. According to the poverty of the stimulus argument, what's required is a basis for learning that is richer than empiricists suppose—a set of structures and processes that isn't restricted to general-purpose learning systems.

Philosophers have been highly critical of this form of argument. Some of the criticisms are based on empirical considerations. It's said that proponents of the poverty of the stimulus argument haven't provided enough evidence to establish that the environment is as impoverished as they claim it is (e.g., Putnam 1967, Cowie 1999). Or empiricists gesture toward considerations suggesting that general-purpose learning mechanisms might be capable of accomplishing the learning task (e.g., that nativists have underestimated the power of statistical methods) (e.g., Prinz 2002). Philosophical critics of the poverty of the stimulus argument have also raised more principled objections. One of these is to insist that learning routinely allows us to go beyond the stimulus (i.e., beyond the evidence supplied by experience) and that such learning is undoubtedly accomplished by empiricist learning mechanisms. For example, in learning what a curry is, or about a given style of art, we can readily determine that something is or is not in the extension of the relevant concept even if we haven't encountered it before and haven't been given explicit evidence about its status. Yet to require a domain-specific mechanism for learning about vindaloo or impressionist painting is absurd (Cowie 1999; see also Goodman 1969, Sampson 2005). More generally, it is evident that paradigmatic instances of general-purpose learning, such as inductive inference, are in the business of using limited, finite data to draw conclusions about a vastly larger range of cases. But if we don't need a specialized nativist learning system for deducing that all men are mortal, why do we need a specialized system for acquiring the rules of English syntax?

All of these objections are based on what we take to be oversimplified accounts of the poverty of the stimulus argument (Laurence & Margolis 2001). One of the main problems—but

by no means the only one—is the failure to recognize that poverty of the stimulus arguments specifically contrast the outcomes of general-purpose learning systems with those of the more specialized learning systems posited by nativist theories. So it's no objection to proponents of the poverty of the stimulus argument that induction goes beyond the evidence of experience. The burden for any instance of the poverty of the stimulus argument isn't to substantiate that, in some sense, an acquired trait surpasses what is experienced, but rather that it does so in a way that cannot be accounted for by learning mechanisms of the kind that empiricists insist on.

One especially vivid type of poverty of the stimulus argument draws upon the results of isolation experiments. These are empirical studies in which, by design, the experimental subjects are removed from all stimuli that are related to a normally acquired trait. For example, Irenäus Eibl-Eibesfeldt showed that squirrels raised in isolation from other squirrels, and without any solid objects to handle, spontaneously engage in the stereotypical squirrel digging and burying behavior when eventually given nuts. Eibl-Eibesfeldt notes that, "the stereotypy of the movement becomes particularly obvious in captivity, where inexperienced animals will try to dig a hole in the solid floor of a room, where no hole can be dug. They perform all the movements already described, covering and patting the nut, even though there is no earth available" (Eibl-Eibesfeldt 1989, p. 21). Since the squirrels were kept apart from their conspecifics, they had no exposure to this stereotypical behavior prior to exhibiting it themselves—the stimulus was about as impoverished as can be. Reliable acquisition of such a complex and idiosyncratic behavior under these circumstances provides extremely good evidence against a general-purpose learning mechanism.

We should stress, however, that a successful poverty of the stimulus argument doesn't require anything as stark as removing learners from their normal environment. Consider an example from the study of language acquisition (Crain & Thorton 1998, Crain & Pietroski 2001). It turns out that English-speaking children sometimes go through a peculiar stage as they learn how to form certain types of questions. They insert an extra *wh*-word, saying things like:

(1) What do you think what Cookie Monster eats?

(2) Who did he say who is in the box?

These sentences are, of course, ungrammatical in adult English. But it's not as if these children randomly insert extra wh-words any which way. On the contrary, their speech exhibits a systematic and predictable pattern in which they only place an extra wh-word in a specific location in a question, they don't insert extra wh-*phrases*, and they don't use extra wh-words when extracting from infinitival clauses. So the following are ungrammatical both to adults *and* to children passing through this phase:

(3) *What do you what think is in the cupboard?
(4) *Which Smurf do you think which Smurf is wearing roller skates?
(5) *Who do you want who to win?

What's more, though adult English speakers don't say any of (1) – (5), the pattern found in their children's speech does appear in other natural languages, including German, Irish, and Chamorro. For example, in German an extra wh-word is used, but not a wh-phrase, making (6) grammatical but (7) ungrammatical:

(6) Wer_i glaubst du wer_i nach Hause geht?
Who do you think who goes home?

(7) *Wessen Buch_i, glaubst du wessen Buch_i Hans liest?
Whose book do you think whose book Hans is reading?

It should be evident that we have all of the materials here for a poverty of stimulus argument. First of all, English-speaking children aren't emulating a pattern that is present in the language they hear while growing up. After all, adult English speakers don't say things like (1) and (2) any more than they say things like (3)-(5). But just as important is that children's selective use of extra wh-words *is* present in languages they *don't* hear. Together these facts make it inordinately difficult to explain the phase these children go through if we were to stick to general-purpose learning mechanisms, such as ones that rely on statistical analysis. Nativists, on the other hand, are well-positioned to explain what's going on. Since nativists generally maintain that language-specific principles are part of the Nativist Acquisition Base, they can postulate that

children are working with a highly constrained hypothesis space and that some children temporarily adopt a set of rules that are laid out in that space even if these rules aren't attested to in the data.

The examples so far have been of poverty of the stimulus arguments in which it's patent that the stimulus is impoverished. But poverty of the stimulus arguments don't always work in such a blatant manner, where an acquired behavior fails to appear in the learning environment altogether. For example, Chomsky and others have argued for a nativist treatment of the principles governing natural languages even though these principles are instantiated in countless utterances that are available to language learners. The key point once again is that the sense in which the stimulus is impoverished is *relative to general-purpose learning systems*. The idea is that such systems couldn't reliably produce the learned outcome on the basis of the utterances that children hear. One reason why this is the case is that the correct hypotheses are not at all the most natural ones for an unbiased learner employing only empiricist learning strategies. Indeed, there are numerous alternatives that would be more natural to such a learner but that would lead the learner astray. A related major problem for empiricist models of language learning is that children don't just need suitable examples of a linguistic principle. They also need to be able to represent the examples in the right way (i.e., in terms of their grammatically relevant properties) to ensure that the utterances they hear can serve as meaningful data for them. A poverty of the stimulus argument of this kind—and there are many—doesn't turn on the absence of a form to be learned. It relies instead on the reasoning that unbiased learners who are granted only general-purpose learning systems would lack the materials that would even allow them to entertain the evidence that points to the linguistic principles to be acquired.

The poverty of the stimulus argument in its different forms offers a forceful reason to posit nativist acquisition systems regarding numerous psychological traits, not just language but also the capacities involved in the representation of number, time, objects, agency, and causation, among others. But the case for a nativist approach to the mind doesn't end with the poverty of the stimulus argument. Given the reorientation that we argued for in §2—focusing on the disagreement between empiricists and nativists regarding the character of the Acquisition Base—it should be clear that adjudicating between the two, in the most general terms, takes the form of an *argument to the best explanation*. So a wide variety of explanatory factors may come into

play. Any factors at all that increase the likelihood of the existence of specialized systems of acquisition would thereby count as evidence in favor of nativism.

One noteworthy implication of this fact—that nativism is to be argued for on explanatory grounds—is often lost in philosophical discussions. It's that psychological traits can be grounded in domain-specific acquisition systems even if the stimulus is *not* impoverished, that is, even if there is no poverty of stimulus argument to be had. Indeed, this situation may be fairly common. Consider again the nut burying behavior of squirrels. Though there is an especially compelling poverty of the stimulus argument regarding its acquisition under experimentally controlled conditions of isolation, squirrels rarely find themselves in this situation. Their normal environment isn't so impoverished, as other squirrels' nut burying behavior is readily observable. So squirrels might acquire knowledge of this behavior through observation. Nonetheless, it looks as though they are equipped with a domain-specific acquisition mechanism (as evidenced by the isolation experiments) that can operate in the absence of the sorts of evidence a domain-general learning mechanism would require.

Why might there be nativist systems of acquisition even when the experiences relevant to an acquired trait aren't particularly impoverished? There are many possible reasons. One is that the trait may be important enough that it can't be left to a less reliable means of acquisition. In fact, sometimes when a trait is important enough, there may even be multiple independent specialized systems involved. This appears to be the case for chicks in how they are able to come to identify their mother. They have one system for detecting a large moving object and another that relies on a shape template (Johnson et al. 1985, Carey 2010).[9] A second reason for the presence of a specialized learning system in the absence of an impoverished environment is the benefit of acquiring a trait rapidly. This is the likely explanation of infants' instinctive avoidance of visual cliffs. It would be easy enough to learn about the danger of cliffs through experience, but this way of doing things would be much slower—and rather more dangerous. Yet another reason for a system to be nativist even if the environment isn't impoverished is the cognitive cost of using a general-purpose system. For example, less cognitive effort is needed, on average, for a learner to acquire a principle based on a forced choice of two options (as in

[9] Carey uses this example to illustrate that it isn't problematic to attribute domain-specific acquisition systems to animals. We wholeheartedly agree. See the argument from animals below.

linguistic parameter setting) than having to choose from an infinite space of possibilities (what a truly unbiased general-purpose system faces).

Although the poverty of the stimulus argument is the most famous argument for nativism, it is just one part of a much larger set of explanatory considerations that argue for nativism. A second major argument for nativism—the *argument from animals*—further strengthens the nativist's case by placing the nativism-empiricism dispute in a broader context. The argument from animals is grounded in the firmly established fact that animals have a plethora of specialized learning systems. In some cases, these systems are broadly shared across species, while in others they are uniquely suited to the particular needs of the species in question. But *human beings are animals too*. Hence, the argument concludes, we should also expect some of these ancient systems to populate our minds, along with some specialized learning systems of our own—ones that are geared towards our own particular needs as animals.[10]

The number of examples of specialized learning systems in the animal kingdom is large and impressive. It includes systems for developing mental maps of the environment, plotting the position of the sun as a function of the date and time, selecting foraging locations based on potential rates of return, avoiding poisonous foods, signaling the presence of species-relevant predators, locating new nest sights, building nests or other homes, acquiring species-typical songs or signals, reorienting using the geometrical properties of the environment, enumerating approximate numerical quantities, detecting kin, identifying relations within a social hierarchy, eluding predators, and much else.[11] However, it is easy to overlook the specialized nature of the learning systems that go with these abilities if you don't attend to all of the subtle relevant behavioral details. For instance, one might suppose that learning to avoid poisonous food is simply a matter of associating a negative event to the sensory event that precedes it. The quicker the onset of the negative event—as Hume would say, the greater the contiguity—the easier it is to learn to avoid food of that type. But in fact, that is not how food aversions are acquired. Rats that are rendered ill after ingesting flavored water learn to avoid that taste, ignoring equally good visual or auditory cues, and the association can be effectively formed after a long latency period—on the order of hours, not seconds. In contrast, rats that are punished via a shock can learn the visual and auditory cues, but the punishment does have to occur within seconds of

[10] For related arguments, see Gallistel et al. (1991) and Carruthers (2006).

[11] For overviews of related empirical work, see Gallistel (1990) and Shettleworth (2009).

ingesting the water (Garcia & Koelling 1966, Revusky & Garcia 1970). What's more, the predisposition to link illness with taste rather than with visual cues isn't universal; some birds favor color (Wilcoxon et al. 1971). And Vampire bats, who are monophagous feeders (they just eat blood), don't form taste aversions at all, even though closely related bat species that are food generalists behave much as rats do (Ratcliffe et al. 2003). Here we have a fairly clear illustration of the limits of a general-purpose learning system. The learning that underlies food aversions is distinct from the processes that subserve arbitrary learned associations and is subject to different predispositions according to the feeding strategy of a species.

Consider another example of a specialized learning system, one that has even less connection with the formation of learned associations. After meandering in search of food, desert ants can find their way home by following a straight line back to their nest. They are able to do this in spite of the fact that their environment is relatively featureless, and so devoid of landmark cues, because of a mechanism for dead reckoning, that is, one that keeps track of changes in their direction of movement and the distance covered. Determining the position of the nest is a matter of combining this information periodically, just as sailors compute their position by noting each change in direction and the speed and duration of the ensuing segment of their journey (using speed and duration to compute distance). The postulation of a system for dead reckoning may at first seem unlikely for an animal as primitive as an ant. Couldn't ants be using a simpler means, such as a scent emanating from the nest, or a chemical signal left on the trail? Evidently not. Experiments reveal that if an ant is displaced en route to its nest, it will follow the corresponding path in terms of distance and angle from its point of displacement and then enter into a random search in the vicinity of where its nest ought to be (Wehner & Srinivasan 1981, Gallistel 1990). Likewise, if an ant's legs are made longer or shorter (by the addition of stilts or through amputation), it will systematically overshoot or undershoot the distance to the nest (Wittlinger et al. 2006). Ants are primitive creatures, but packed into their brains is a mechanism for dead reckoning (just one of the specialized systems that insects use for navigation). And it isn't only ants that have such a mechanism. Dead reckoning is an example of a widely shared ability that can be found in animals with brains that are considerably larger than an ant's, including human beings (Loomis et al. 1999). Once again, without carefully attending to the behavioral details, it would be easy to posit a broadly empiricist account of these abilities.

But on closer examination, they turn out to be far more complex than one might initially have imagined, and the systems of acquisition need to do justice to this complexity.

We've seen that work on animal psychology indicates the prevalence of specialized systems of acquisition. A related benefit to learning about animal minds is that it offers a useful perspective on capacities that have been studied almost exclusively in human subjects. For example, developmental psychologists have taken a great interest in the acquisition of the so-called object concept in childhood. This includes the ability to represent the existence of an object through incidents of occlusion. (For adults, a ball that rolls under the bed isn't thought to go out of existence just because it is no longer visible.) Under Jean Piaget's influence, psychologists once supposed that this is an ability that is built up incrementally over a long period of time and that infants have to learn the basic object concept as they pass through identifiable general stages of development that constrain other areas of cognition. Subsequent work with infants has cast doubt on Piaget's view about infants' representational abilities.[12] A more radical critique, however, looks to the young of other animals—and not just our close relatives. For example, newborn chicks can represent partially occluded objects, yet there is little question about whether they pass through the stages that Piaget thought were essential to human cognitive development—they don't (Regolin & Vallortigara 1995). And, of course, if the evidence points to object representations in chickens being acquired by a domain-specific system, it shouldn't be outlandish to suppose that there is a comparable system in humans.

In sum, nativism about the mind is in a very strong position. The poverty of the stimulus argument, the argument from animals, and numerous related explanatory considerations build upon an abundance of empirical data to establish that special-purpose systems are a key element in the acquisition of psychological traits.

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[12] Piaget's views were based on observations of children failing tasks that involve searching and reaching, as when 6-month-olds cease trying to obtain an object once it is covered by a blanket (Piaget 1954). More recent work in developmental psychology questions the emphasis on manual search and relies instead on measures of infants' attention. One technique is to use looking time to infer which of two events is the more expected. For a useful overview of how this method supports conclusions about the way that infants represent the physical world, see Baillargeon (2004).

4. Objections

When philosophers take nativism to be worth considering at all, they usually find it to be deeply problematic. In this section, we look at some of the most significant and influential objections to nativism that its critics have had to offer. The objections we will consider are all general in scope (rather than objections that focus on particular nativist proposals regarding particular psychological traits). Since our aim is to address the root causes that lead many philosophers to be dismissive of nativism as a framework for theorizing about the mind, it's these general objections that demand a response.

Nativism is unproven. Philosophers often suppose that until nativism meets the highest standard of validation, we shouldn't take it seriously. In a representative expression of this viewpoint, Nelson Goodman (1967) argues that short of a demonstration that language is independent of experience—through an isolation experiment in which infants grow up completely in the absence of linguistic input—nativism isn't even worthy of discussion. In a similar vein, many philosophers take it for granted that empiricism is the default view, so that nativism should only be considered once all empiricist alternatives have been ruled out.

While these onerous standards are widely assumed to be correct, they are totally inappropriate. Given that the dispute between empiricists and nativists is fundamentally about the character of the structures and processes that subserve the acquisition of psychological traits (the Empiricist vs. the Nativist Acquisition Base) (§2), and given that this issue is ultimately to be decided on explanatory grounds (§3), the right standard of evaluation isn't a proof. The fate of nativism turns on the sort of non-demonstrative considerations that are found in science generally. Since many factors can enter into an inference to the best explanation for nativism, isolation experiments are in no way essential. Nor is it necessary to locate a smoking gun that categorically eliminates all empiricist hopes. The case for nativism is built upon the collective force of the various explanatory considerations that tell in favor of psychological acquisition mechanisms with a certain character. In this way, the vindication of nativism is no different than, say, the vindication of the germ theory of disease.

As for empiricism being the default view in the nativism-empiricism dispute, this widely repeated idea is based on nothing more than an ideological bias. The arguments of §3 show that nativism is exceedingly plausible regarding a diverse range of psychological traits; at the very

least, these arguments supply a prima facie case for nativism. So if empiricism is to be taken as the default view, we need a strong positive argument for why this should be. The main argument that is usually given, if any is given at all, is that empiricism is to be preferred for being the more parsimonious theory. Now it is true that there is a crude sense in which empiricism is more parsimonious in that empiricism takes there to be fewer types of psychological structures and processes underlying psychological development. But there are many different types of parsimony, and there is no reason to suppose that this particular type of parsimony is more important than others. For example, for any given phenomenon, a nativist model of cognitive development may well be more *computationally parsimonious* than an empiricist one. As we suggested above, by tightly constraining the hypothesis space that children have to consider, nativist models of language acquisition may be less computationally demanding than their empiricist competitors. Similarly, the computational load on a nativist model might be lighter owing to access to specialized representations that are especially suited to a task-domain. Nativist models might also be more parsimonious in terms of *evolutionary continuity*, as would be expected given the argument from animals, or more parsimonious in yet other ways. But even in the highly unlikely event that empiricism were more parsimonious than nativism in some way that everyone could agree takes precedence, this would be of minor import. Considerations of parsimony would be easily trumped by explanatory considerations that directly argue for particular psychological acquisition mechanisms or processes.

Nativism is unscientific. There are various ways in which nativism is supposed to be unscientific. Sometimes nativism is thought to exhibit 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. Sometimes the charge is that nativism is wedded to the field of evolutionary psychology, which in turn is said to be little more than a litany of "just-so" stories. Sometimes it's just that by standing in opposition empiric*ism*, nativism is thought to be anti-empiric*al*. We'll take these points in order.

The accusation of theoretical laziness displays a woeful disconnect from nativist theorizing. Nativists and empiricists have essentially the same burden, namely, to provide the best explanation of the acquisition of given psychological traits. Even when nativists claim that a trait is part of the Acquisition Base, they, like empiricists, have to show why their claim should

be accepted, which itself is no trivial matter and is a responsibility that nativists take quite seriously. Moreover, as we noted earlier, nativism isn't primarily about identifying innate traits. Nativism is in the business of postulating specialized systems of acquisition that are needed to account for psychological development. These are often systems that can be specified in detail and that are accepted precisely because they can account for aspects of development that are mysterious on competing empiricist theories. In all of the examples we've discussed—from language to food aversions to dead reckoning—nativists are clearly engaging in a substantial explanatory enterprise; they aren't unthinkingly taking psychological structures to be innate.

What about the claim that nativism is hampered by its ties to the discredited methods of evolutionary psychology?[13] First of all, nativists needn't be committed to evolutionary psychology or to adapationist accounts of the origins of psychological traits. Two of the most well-known contemporary nativists—Chomsky and Fodor—have been less than enthusiastic about evolutionary approaches to the mind.[14] Even among nativists who aren't opposed to evolutionary psychology, it's often the case that their theories make no outright claims about evolution; instead, their theories are directed to the findings in such fields as developmental psychology and animal psychology. For instance, the evidence that chickens can perceive partially occluded objects without having to learn about occlusion doesn't come from an investigation of the adaptive function of representing the physical world. It comes from the investigation of how chickens respond to novel displays given a history of experimentally controlled deprivation in visual experience (Regolin & Vallortigara 1995).

Still, it's one thing to say that nativists aren't obliged to be adaptationists. It's another to capitulate to the blanket rejection of adaptationist explanations of domain-specific systems. In our view, such a rejection is entirely unwarranted. It overlooks the most plausible case studies for adaptations and flies in the face of the argument from animals. For example, though one doesn't have to engage in adaptationist thinking to draw plausible nativist conclusions from the food aversion studies, even a modicum of reflection on the overall pattern in the data suggests an adaptationist explanation that can be used to guide further research. Fortunately, this is exactly

[13] For an overview of the field of evolutionary psychology, see Pinker (1997), Buss (2005).

[14] Chomsky has always resisted the idea that evolutionary theory has anything useful to contribute to our understanding of the structure of the language faculty; see, e.g., Chomsky (1980). And Fodor is one of evolutionary psychology's staunchest critics; see, e.g., Fodor (2000), the title of which is meant to indicate his negative reaction to Pinker (1997).

how the research has played out. Insightful early commentators noticed that both the differential emphasis on taste in rats and the potentially long durations that pass between the "association" of stimulus and punishment make perfect sense from a biological and ecological perspective (see, e.g., Rozin & Kalat 1971). As generalist-eaters, rats have to figure out which foods to avoid, and since the toxins in a food might not have an immediate impact, rats have to learn to avoid foods they may have eaten some time ago and not focus on the most immediate stimulus. A food-aversion system that functions in this manner would have considerable adaptive value. But notice that it would be useless for monophagous feeders. This reasoning subsequently led researchers to make predictions about species that should, and species that shouldn't, be able to acquire food aversions—predictions that have held up under experimental testing (Ratcliffe et al. 2003).[15]

To the extent that the worry about just-so stories has any credence, it is also important to note that it would have as much impact on empiricism as nativism—they are perfectly on a par as far as this objection goes. This is because the two are equally concerned with the types of structures and processes that ultimately account for psychological development (i.e., the Acquisition Base). If a further account is needed to explain how these structures and processes evolved, it doesn't matter whether the theory of psychological development makes do with general-purpose systems or whether it embraces more specialized systems. And it's not as though empiricists have a well-worked out evolutionary explanation of the general-purpose systems to which they are partial.

Finally, we can be brief regarding the charge that nativism is inherently anti-empirical. The nativist response is simply that it is a gross mistake to equate empiricism with the idea of using empirical methods. Nativist theorizing draws heavily upon a wealth of empirical information, including data from experiments with children, with adults in differing cultures, with animals, with twins, with "knocked out" or disabled genes, and with patients who have undergone neurological damage. Nativist theorizing also makes considerable use of detailed observations regarding features of mature psychological traits, employing these to constrain theories of psychological development. Indeed, much of the reason that contemporary nativism

[15] In these experiments, the monophagous feeders (vampire bats) weren't directly compared to rats. They were compared to other species of bats, ones with varied diets. As a result, the adaptationist explanation made *two* substantive and correct predictions—that the vampire bats wouldn't develop the taste aversion and that the other species of bat would.

is thriving is because it is so richly grounded in scientific investigation. Today's most important nativist figures are themselves working scientists—linguists, developmental psychologists, animal psychologists, anthropologists, and neuropsychologists—who are deeply committed to a scientific approach to questions about the mind. The idea that nativism is anti-empirical is not merely false, but completely stands the truth on its head.

Nativism is overly intellectualist. The next objection charges that nativism overly intellectualizes the mind. The objection highlights the fact that the nativism-empiricism debate is linked to a broader set of issues. Nativists and empiricists do not just differ in how they view psychological development, but also in how they view the *mature* mind. In particular, nativists often take mature behavioral capacities to require complex, sophisticated cognitive traits, where empiricists take them to involve simple cognitive traits, or no cognitive traits at all. This makes sense given that the richer and more complex the mature mind is, the harder it is to acquire using only a few, simple, domain-general acquisition systems. It is also one of the reasons why the nativism-empiricism dispute is so deeply entrenched and difficult to resolve—and why it is so important. In the end, the nativism-empiricism debate involves very different competing pictures of the overall structure the mind (Chomsky 1968, Samuels 2002).

The empiricist tendency to see the mind as relatively lacking in complexity is starkly evident in the strands of empiricism that claim there is little or nothing more to the mind than perception and action-governing mechanisms. You can see this in behaviorists like B.F. Skinner and his proposal that a person's verbal behavior can be accommodated entirely in terms of a socially-mediated history of reinforcement (Skinner 1957). But the same impulse is alive and well in the 21st century. Rodney Brooks describes the cornerstone of his subsumption architecture approach to robotics as the realization "that the so-called central systems of intelligence—or core AI as it has been referred to more recently—was perhaps an unnecessary illusion, and that all the power of intelligence arose from the coupling of perception and actuation systems" (Brooks 1999, p. viii). On this view, perception doesn't interface with a distinct cognitive system that is needed to plan a course of action. Instead, perception directly leads to action. Brooks's team has succeeded in building robots that can move about a room without bumping into obstacles—an achievement that Brooks and others take to approximate insect behavior. But his proposal is far more ambitious, claiming that "the subsumption

architecture (or one like it in spirit) can be expected to scale up to very intelligent applications" (Brooks 1999, p. 175).

Though these sorts of claims make for exciting press, they are extremely implausible as general accounts of the mind. Skinner utterly failed to see the complexity of language and consequently the complexity of the mental states and processes underlying language use (Chomsky 1959). For Brooks, things aren't much better. Indeed, we would argue that Brooks has not even begun to capture the complexity of *insect* behavior, much less anything that approximates human action. Consider the case of dead reckoning discussed earlier—something that ants can do. Dead reckoning involves integrating information about changes in distance and direction. At a minimum, this requires computations that have access to stored representations and hence cannot be accomplished by action-guiding systems that respond merely to what is immediately perceived. Likewise, Brooks is in no position to explain the bee dance system of communication, in which bees consolidate information about the physical movements of fellow bees with other information (e.g., about food quality) and use this to determine whether to leave the nest and, if so, which direction and distance to fly in, all the while compensating for changes in the sun's position owing to the amount of time spent in the nest (Gould & Gould 1995). Moreover, these difficulties just scratch the surface. Once one begins to look closely at what real living insects can do, rich cognitive explanations are all but inevitable. Take the way that ants select a nest site. Franks et al. (2003) show that ants (of the species *Leptothorax albipennis*) are sensitive to a number of factors, including floor size, ceiling height, entrance size, darkness level, the hygiene of the cavity, and the proximity of hostile ant groups. The ants exhibit consistent ranked preferences for a range of such factors, both in pairwise choices between potential nests, and choices among a larger range of options. This suggests that the ants have stable preferences which, given the infrequency of their use in natural conditions, cannot be learned. Moreover, in analyzing the ants' decision-making process, Franks et al. were able to rule out several relatively simple strategies which might be used in other domains (a satisficing strategy, for example, or a lexicographic strategy, where the nest with the highest value on the top ranking feature is chosen, with ties decided by the highest value on the second highest ranking feature, and so on). Franks et al. conclude that ant colonies are using a weighted additive strategy, "one of the most thorough, computationally expensive, and time-consuming, decision-making strategies" (Franks et al. 2003, p. 222). It would seem that the ants' behavior calls out for a specialized learning

system, not a general-purpose one.

Another example of the importance of attending to the complexity of behavior, a particularly ironic one for empiricists, is their treatment of learning in terms of strengthened associative bonds. Take conditioned learning. Empiricists have often maintained that the learning that occurs (e.g., learning to press a bar after seeing a light) doesn't require specialized systems. It only requires a general capacity to strengthen an association between seeing the light and pressing the bar (or a corresponding association in the brain). The bond gets stronger when the interval between the events is shorter and as the reward or punishment increases in intensity. Although this model has been extremely influential, recent work argues that conditioned learning is not a matter of strengthening an association, but involves computing the rate at which a contingency occurs. C.R. Gallistel and John Gibbon (2002) show that empiricists have overlooked evidence, often available in the empiricists' own data, that learned associations are in fact independent of each of the standard empiricist factors that are supposed to determine strength of association—the temporal closeness of the pairing, the repetition of the pairing, and the strength of the reinforcement. For example, in standard bar press reward experiments, the temporal closeness of the pairing of response and reward is not relevant, provided that the ratio between the time between trials and the time between stimulus and reward is held constant. On Gallistel and Gibbon's rate estimation theory, this is because the pairing of response and reward is highlighted when the contingency of the one on the other is made salient by fixing this ratio. Empiricists, in the grip of the bond strength model of conditioning, failed to consider this possibility, even when their own data supported it. Much the same applies to the other factors that allegedly determine strength of association. These and related findings strongly suggest that the system that supports conditioned learning is a specialized system, perhaps one with an evolutionary history tied to foraging behavior. Our main point, however, isn't that the rate estimation theory is the right one, but how easy it is to overlook the aspects of behavior that make conditioned learning a more complicated, and more interesting, phenomenon than empiricists suppose it to be, and that this has immediate implications for theories of the mind.

Seeing the complexity of behavior (people talking, ants going about their business, etc.) is surprisingly difficult. As Chomsky has noted:

> One difficulty in the psychological sciences lies in the familiarity of the phenomena with which they deal. A certain intellectual effort is required to see how such phenomena can

> pose serious problems or call for intricate explanatory theories. One is inclined to take them for granted as necessary or somehow 'natural.' … we also lose sight of the need for explanation when phenomena are too familiar and 'obvious'. We tend too easily to assume that explanations must be transparent and close to the surface. (Chomsky 1968, pp. 21-2)

The empiricist strategy has always been to suppose that behavior itself is simple and that its explanation only requires a few basic systems whose operations can be compounded. All we need are more associations, or more direct links between perception and action, or something similar.[16] But what the examples we've been discussing show is that all this talk of "scaling up" is wishful thinking based on an inadequate understanding of the behavior and the abilities that ultimately need to be accounted for. Empiricists have it exactly wrong. Nativism doesn't over-intellectualize the mind; empiricism under-intellectualizes it.

Nativism is a confused doctrine. The last objection we'll discuss isn't confined to saying that nativism is wrong. The claim, instead, is that nativism is utterly confused. One kind of confusion that nativists are regularly accused of has to do with role of the environment. Nativists are said to claim that psychological development has nothing to do with the environment, when in fact environmental input is necessary for all development. Another kind of confusion that nativists are accused of concerns the notion of innateness. Nativism's critics insist that it is ill-defined and hence can't do any meaningful work. The ordinary concept of innateness is problematic in that it conflates a number of distinct properties (e.g., present at birth, genetically determined, universal), while the most viable scientific concepts of innateness that have been proposed are too diverse to stake out a single subject matter. On top of this, there is no philosophical consensus about the correct way to refine and explicate a unified scientific concept of innateness. The attempts of philosophers to formulate an adequate definition are continually met with counterexamples.[17]

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[16] Historically, a further reason why philosophers have had trouble recognizing the complexity of the mind is that they relied too heavily on introspection. While this is not the case for contemporary philosophers whose work is informed by the cognitive sciences, philosophers who are somewhat at a distance from the scientific study of the mind may not realize that there is no longer any serious scientific dispute about the enormous extent to which unconscious mental processes dominate mental life and consequently about the fact that introspection is often a poor guide to the mind's working. See, e.g., Searle (1992). It is no coincidence that Searle is skeptical both about the unconscious and about standard nativist models of language acquisition.

[17] For some noteworthy recent proposals, see Ariew (1996), Cowie (1999), Sober (1999), Wimsatt (1999), Samuels (2002), Mallon & Weinberg (2006), Khalidi, (2007), Mameli (2008).

The developmental psychologist Nora Newcombe offers a succinct version of the first of these charges. She asserts that nativists "have to argue that the cause of developmental change is environment-independent maturation." The reason they have to do this is because, "[o]therwise, the position would be a domain-general interactionist one…" (Newcombe 2002, p. 399). Similar remarks appear in the influential book *Rethinking Innateness*, following the claim that innate psychological structures can only be ones that "are the product of interactions internal to the organism" (Elman et al. 1996, p. 23). Though nativism is often rejected on these sorts of grounds, the charge is based on a significant misapprehension. As we've seen, nativism does *not* hold that the environment is irrelevant to development. The question for nativists, as for empiricists, is what kind of learning systems, and what other psychological systems of acquisition, interact with the environment to produce our psychological traits. Newcombe seems to think that the only possibilities are to be found among domain-general systems. But the whole point of nativism is to put forward the idea that an abundance of foundational domain-specific systems are needed as well (as in the Nativist Acquisition Base). Chomsky isn't succumbing to *empiricism* when he proposes that language learning depends on exposure to speech (input from the environment) that is interpreted by the child in accordance with the principles of Universal Grammar. There is no confusion here, just a misunderstanding on the part of nativism's critics.

The second charge of confusion—that nativists lack a satisfactory definition of *innate*—requires a more elaborate response. The first and most important thing to say is that nativism needn't be understood in terms of the concept of innateness. One of the central morals of the reorientation that we argued for in §2 is that the correct formulation of nativism is in terms of the dispute between nativists and empiricists, and that this is best understood in terms of their views about the Acquisition Base. The issue that divides empiricists and nativists isn't whether there is any innate structure, and certainly isn't about whether the concept of innateness makes sense.[18] It's about the character of the structures and processes that ultimately explain the acquisition of all traits that are acquired via psychological processes. If these structures and processes include a significant number of domain-specific traits, then the resulting picture is a nativist one; if these

[18] It also isn't about the ordinary use of the term *innate*. As theoretical frameworks regarding the study of the mind, nativism and empiricism are no more beholden to the everyday use of a term than any other scientific endeavor.

structures and processes include only a few domain-general traits, then it is an empiricist one.[19] Notice that in setting out the disagreement in this way, the concept of innateness needn't even come into it.

Nonetheless, if we are clear about this situation, then 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 interesting property of these "innate" components is, of course, that they aren't acquired via psychological processes. In the philosophical literature on innateness, psychological traits that aren't themselves acquired via psychological processes are said to be *psychologically primitive*, and are prominent in an account of innateness known as *primitivism* (Samuels 2002, 2007; see also Cowie 1999). Primitivism figures in a dispute about the necessary and sufficient conditions for something's being innate. According to Samuels's primitivism, a given trait, T, is innate for organism O just in case (i) T is not acquired by O via a psychological process and (ii) O would acquire T in the normal course of events.

In our view, primitivism contains an important kernel of truth, since it draws attention to the Acquisition Base, which is exactly where our own account of the nativism-empiricism says the focus should be. Still, we don't endorse primitivism's analysis of innateness. Indeed, although we see no problem with the coherence of nativism as a doctrine, we share with some of its critics the sense that none of the definitions of innateness on offer are satisfactory. In our view, however, the real problem with the philosophical literature on innateness is its preoccupation with definitions. This project of seeking an explicit set of necessary and sufficient conditions for the term *innate* has led philosophers to give far too much weight to proposed counterexamples that shed no light whatsoever on the nativism-empiricism debate. For example, one case that is commonly thought to cause trouble for primitivism is the so-called Latin pill—a hypothetical pill that implants knowledge of Latin without any intervening psychological processes. If there were such a pill, you wouldn't have to go to class, or study a book, or practice declensions. All you'd have to do is pop the pill. Notice, though, that nativists and empiricists

[19] While empiricists may endorse some domain-specific acquisition systems, the dispute about the Acquisition Base remains. This is because they will generally suppose that such domain-specific systems are themselves acquired on the basis of more fundamental domain-general ones. See, e.g., Karmiloff-Smith's treatment of acquired mental modules (Karmiloff-Smith 1992).

do *not* disagree about cases like this: it's not as if either party in the dispute wants to claim that such cases tell us about what goes into the Acquisition Base. Hence there is little to be gained by arguing about what to do with it, or by packing into a proposed definition further clauses that speak to the purported difficulties it raises.

In any event, most theoretically interesting terms—indeed, most terms, interesting or not—cannot be defined (Fodor 1981). This just goes to show that if we want to use the term *innate*, then we shouldn't be looking for an airtight definition that stands up to all possible cases. Rather, we should be seeking a conceptual clarification, one that focuses on capturing the relevant core cases in theoretically illuminating ways. We'd suggest that characterizing innateness in terms of the Acquisition Base does just this. The characterization of innateness should be tied to what nativists and empiricists disagree about. And what nativists and empiricists disagree about, in the first instance, is what's included in the Acquisition Base, or, if you like, which traits are psychologically primitive.[20]

The mark of a valuable theoretical concept in science is whether it proves to be useful in an ongoing research program. A valuable theoretical distinction earns its keep in just the same way. Given this standard, the ongoing dispute between empiricists and nativists has been enormously productive, as theorists from each side have challenged one another to show that the best overall account of the psychological structures and processes involved in the acquisition of psychological traits ultimately appeals only to general-purpose systems (in the case of empiricism) or also appeals to specialized, differentiated systems (in the case of nativism). For this reason, there should be no question that nativism is a cogent theoretical framework of some consequence.

5. Nativism about Concepts

Though the nativism-empiricism dispute covers the full range of psychological traits, philosophers have always had a special interest in the status of concepts. Unfortunately, nativism about the conceptual system has gotten a bad name through its association with Jerry

[20] Notice as well that to the extent that nativism relies on the notion of innateness, so does empiricism. So it would be a major double standard to hold it against nativism that the notion of innateness is ill-defined, while simultaneously seeing this as an advantage of empiricism, as many empiricists seem to do.

Fodor's *radical concept nativism*. According to this view, virtually all concepts corresponding to individual words—including even such unlikely candidates as QUASAR and UKULELE—are innate (Fodor 1975, 1981).[21] Fodor's radical concept nativism has few if any adherents, and rightly so in our view. It isn't at all plausible, and the arguments Fodor has offered on its behalf don't stand up.[22] This, however, does not mean that nativist views about the human conceptual system should be abandoned, only that Fodor's radical nativist view should be.

Given the understanding of the nativism-empiricism dispute that we argued for in §2, we propose that the most plausible nativist account of the origins of human concepts has two broad components. First, it posits a class of concepts that are part of the Acquisition Base, and hence unlearned. These concepts are part of the psychological systems that comprise the basis for acquiring further concepts. In our view, a significant number of concepts should be taken to be part of the Acquisition Base, though nothing like the number that Fodor has suggested. Likely contenders include concepts associated with objects, causality, space, time, and number, concepts associated with goals, functions, agency, and meta-cognitive thinking, basic logical concepts, concepts associated with movement, direction, events, and manner of change, and concepts associated with predators, prey, food, danger, sex, kinship, status, dominance, norms, and morality.[23] Second, and crucially, nativists should embrace a substantial range of concepts that are acquired through learning. No doubt, some concepts are learned via empiricist learning systems, but at the same time, as emphasized earlier, there is no incompatibility between nativism and learning.

Though learned concepts have received hardly any attention in contemporary philosophical discussions of nativism, they ought to be at the heart of any nativist view of the conceptual system. To illustrate the breadth of the resources that nativists have at their disposal, we will briefly sketch two nativist models of how certain concepts may be learned. The first

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[21] Alternatively, Fodor's view could be expressed in terms of the claim that such concepts are part of the Acquisition Base.

[22] We've argued against Fodor's radical concept nativism elsewhere; see Laurence & Margolis (2002). We should note that Fodor's views on innate concepts have changed somewhat (see Fodor 2008). Nonetheless, Fodor continues to be skeptical of learning models, and his current biological approach to concept acquisition inherits many of the problems associated with his earlier view; see Margolis & Laurence (2011) for a critical assessment.

[23] Although nativism shouldn't be identified with the view that there are innate psychological traits, this doesn't mean that nativists should be shy about postulating that some concepts are part of the Acquisition Base. The examples cited in the text are all ones where there is either ample empirical evidence, or persuasive theoretical considerations, in support of this claim.

relies on specialized cognitive sub-systems that are devoted to the acquisition of a given type of concept, where the acquisition system provides a *template* for concepts of this type. The idea is that these sub-systems are activated by only certain kinds of conditions and that they fill in the template according to the ensuing experiences that the learner has. An example of this sort is the proposal that human beings have a specialized system for acquiring concepts of animals. In earlier work, we sketched a model of how this might be realized by combining a causal theory of content with an atomistic theory of concepts, though the general approach can be developed using other theories of content too (Margolis 1998, Laurence & Margolis 2002). Whatever theory of content is adopted, the claim is that the learner is sensitive to certain cues that a perceived item is a new animal, that in the presence of these cues a new representation is produced, that salient perceptual information about the animal is recorded in connection with this representation (controlling its subsequent activation), but that there is also an accompanying disposition to treat further items as instances of the original kind only if they have the same essential nature (though the learner doesn't actually have to know what the relevant essential properties are in any given case). Psychologically speaking, something can look like an animal of one type yet be an instance of another, just as something can fail to look like an animal of one type yet be an instance all the same. This form of essentialist thinking allows one to initially apply an animal concept to an item but withdraw it upon learning information that would suggest that appearances are deceiving (e.g., learning about an animal that looks and smells like a skunk only because it has undergone plastic surgery). As it happens, essentialist thinking about animals is robust across cultures, it appears early in development, and there is evidence that it emerges with little support from parents.[24] However, a nativist needn't say that a concept like ZEBRA is part of the Acquisition Base. Rather, she can say that there is a domain-specific system that supports the acquisition of animal concepts in general and that this system is part of the Acquisition Base. What determines which particular concepts are acquired would then depend upon the animals that the agent happens to come across. This template-based approach, with certain modifications, works well for a variety of different types of concepts apart from concepts of animals, including concepts of nonliving natural kinds, concepts of individuals (name concepts), and concepts of artifacts, among others (Laurence & Margolis, forthcoming).

[24] For cross-cultural evidence, see Atran & Medin (2008); for an overview of the disparate research on essentialist thinking in children, see Gelman (2003).

Our second example of a nativist model for learning new concepts is one that depends on the interaction of domain-specific systems with one another and with general-purpose systems. In this case, learning results in a cognitive arrangement that exceeds the functions of these systems taken individually, but where the concept nonetheless is substantially governed by domain-specific inference patterns inherited from components of the overall system of acquisition. A good instance of this strategy can be found in Pascal Boyer's account of the origins of many religious concepts (Boyer 2001). Boyer proposes that these concepts draw upon a small number of specialized systems that embody core intuitive theories, including folk psychology, folk biology, and folk physics—all of which are part of the Nativist Acquisition Base. New religious concepts (e.g., concepts of spiritual beings) arise when unexpected deviations from these theories are considered. The fact that the deviations are limited to a few salient changes allows for the prior inferential structure to remain largely in tact. For example, if one were to hear about trees that talk, this would allow access to most of the inferences regarding trees (they still grow, need water, etc). Yet the fact that the deviations are unexpected makes them memorable and hence likely to become established in the mind and to be conveyed to others who in turn are likely to remember them and pass them along to still others. If Boyer is right, religious concepts of the kind he is concerned with certainly depend upon experience. It's because members of a community hear about the famous trees that talk that they develop concepts of these supernatural beings. But the cognitive systems that mediate this learning aren't ones that simply fill in the details of, say, a spiritual being template. Rather, a considerable amount of structure that derives from domain-specific inference systems comes to interact with quirks about human memory and with other general cognitive resources when supplied with what happens to be the right input.[25] There is no guarantee that any old description of a supernatural being will take hold. If it isn't memorable, or deviates too much from the inference systems that underlie core domains in cognition, then the corresponding concept will have little chance. But for the concepts that are competitive, they are readily acquired in part because the mind has an organization that is receptive to them.

[25] Notice that what makes this a nativist model isn't the supposition of a "religion module" or the claim that certain religious concepts are part of the Nativist Acquisition Base. The crucial point is simply that the acquisition of the concepts is substantially dependent on a Nativist Acquisition Base through the orchestration of a number of domain-specific cognitive systems in such an Acquisition Base.

There are other possibilities that we could mention, but these two models illustrate the range and strength of nativist accounts of concept learning. Nativism is not restricted to claiming that some set of concepts is part of the Acquisition Base and hence unlearned. Learning is vital to nativism about concepts, just as learning is vital to nativism about most other psychological traits. Once this point is fully appreciated, and once Fodor's singularly extreme form of concept nativism is set aside, a nativist approach to concepts becomes quite attractive. Indeed, the fact that nativism is so plausible regarding a host of other psychological traits, including core elements that these learning models draw upon, provides a powerful general argument for concept nativism.

6. Conclusion

We've argued that nativism offers a highly promising general framework for the study of the mind. There is a great deal of support for nativism, as illustrated by the poverty of the stimulus argument, the argument from animals, and the many empirical findings that contribute to an inference to the best explanation in favor of nativism. We've also seen that the objections that are standardly thought to impugn nativism fail, and that, given the insight that learning is compatible with nativism, nativism regarding the conceptual system is highly plausible.

Noam Chomsky has remarked that there is an upper and lower bound on the complexity and richness of the innate structure that must be postulated to explain any instance of learning. For example, it won't do to say that English is innate, or part of the Acquisition Base, since children who acquire English would have acquired another natural language had they grown up in a different community. But at the same time, we need to postulate a rich enough Acquisition Base to explain why children can acquire English when other animals can't, and to account for the specific patterns that are found in language acquisition that aren't predicted by general-purpose learning systems. As Chomsky sees things, one of the difficulties in navigating between these two boundaries is a bias to suppose that the mind is fundamentally a simple thing. "My own estimate of the situation is that the real problem for tomorrow is that of discovering an assumption regarding innate structure that is sufficiently rich, not that of finding one that is simple or elementary enough to be 'plausible'" (Chomsky 1968, p. 70). There are two important ideas here that go a long way toward explaining the misplaced resistance to nativism. One is the

recognition that there is a strong tendency in academic research to adopt empiricist methodological standards, not on empirical grounds, but on the basis of an intuitive sense of simplicity or what counts as the more "scientific" way of thinking. The other is that this methodological outlook makes it difficult to see the complexity in the psychological capacities at issue and hence makes it even harder to see that the explanation of these capacities may require correspondingly complex structures. If you think the mind is simple, then you won't be on the lookout for idiosyncratic patterns like the use of extra wh-words among English-speaking children. Or you might just view the development of a food aversion as being akin to any old association. The nativist insight, however, is that we need to overcome these methodological blinkers and look more closely to see what is going on with these not particularly unusual phenomena and to allow ourselves to be puzzled by their intricacy. Why is it that three-year English-speakers talk like Germans when they ask certain sorts of questions? Why is it that rats readily link a taste from several hours ago to their current nausea and yet they can't link a sound from several hours ago to the same feeling of discomfort? Looking back over the past 50 years of research in cognitive science, it has been a major discovery that the mind and its behavioral manifestations are far more complicated than anyone had imagined. Ultimately, nativism is about this empirically-based picture of the mind's operations. It's the idea that we need a psychological organization that can do justice to the conglomeration of our many complex psychological capacities. In this light, a complex psychological organization isn't a brazen and ungrounded speculation. It just may be essential to understanding how the mind actually works.

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