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INNATENESS AND DOMAIN SPECIFICITY

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ABSTRACT. There is a widespread assumption in cognitive science that there is an intrinsic link between the phenomena of innateness and domain specificity. Many authors seem to hold that given the properties of these two phenomena, it follows that innate mental states are domain-specific, or that domain-specific states are innate. My aim in this paper is to argue that there are no convincing grounds for asserting either claim. After introducing the notions of innateness and domain specificity, I consider some possible arguments for the conclusion that innate cognitive states are domain-specific, or vice versa. Having shown that these arguments do not succeed, I attempt to explicate what I take to be the connection between innateness and domain specificity. I argue that it is simply easier to determine whether and to what extent domain-specific cognitive capacities are innate. That is, the relation between innateness and domain specificity is evidential or epistemic, rather than intrinsic.

1. INTRODUCTION

There is a widespread assumption in the cognitive sciences that there is an intrinsic link between the phenomena of innateness and domain specificity. By an intrinsic link, I mean one that follows directly from the properties of the phenomena involved, or follows from them when supplemented with a few uncontroversial assumptions, say concerning the capacities of the human mind, its adaptive character, or the nature of belief fixation. Though they may not think that the connection is a universal one, many authors seem to hold either that innate mental items will by and large be domain-specific, or that domain-specific capacities will typically be innate.[1] My aim in this paper is to argue that there are no convincing grounds for asserting either of these claims and that no good evidence has been presented for them. In order to make this case, I need to be clearer on the nature of innateness and domain specificity. After briefly clarifying these notions I will consider a number of different attempts to show

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that innate cognitive states are by and large domain-specific ones, or vice versa. Having shown that none of these attempts succeed, I will attempt to explicate what I take to be the relation between innateness and domain specificity. To anticipate, I will argue that it is simply easier to determine whether and to what extent domain-specific cognitive capacities are innate. That is, the connection is not intrinsic, but evidential or epistemic.

Before embarking on this task, I will cite some evidence that the link between innateness and domain specificity is widely accepted, so that it does not appear as though I am jousting against windmills. In an introduction to an influential collection of papers on domain specificity, Lawrence Hirschfeld and Susan Gelman point out: "Although all domains may not be innate, these combined chapters strongly argue that some, perhaps much, of domain knowledge *must* be" (1994, p. 28; emphasis added). Similarly, Barbara Landau indicates that there are three "empirical hallmarks" of the innate cognitive endowment, one of which is "the domain-specific nature of this competence ..." (1998, p. 576). Leda Cosmides and John Tooby note likewise that domain-specific mechanisms (or modules) are evolved adaptations, which implies that they are innate to the cognizer and acquired in the course of phylogenetic history (1994, p. 85). Elsewhere, Tooby and Cosmides state: "the human psychological architecture contains many evolved [hence, innate] mechanisms that are *specialized* for solving evolutionarily long-enduring adaptive problems and ... these mechanisms have *content-specialized* representational formats, procedures, cues, and so on" (1992, p. 34; emphasis added). Frank Keil characterizes what is distinctive about nativism as follows: "nativist views endorse the presence of multiple learning systems each of which is especially effective at acquiring a particular kind of information ..." (1999, p. 584). Even those researchers who dispute the link between innateness and domain specificity (or modularity), in one direction are forthright in asserting it in the other. Thus, Alison Gopnik and Andrew Meltzoff argue that much of what is innate could be theoretical in nature rather than modular, but they still hold that all that is modular is innate: "While modules are innate, not all innate structures are modular" (1997, p. 51).

In some of the work cited in the previous paragraph, the emphasis is on *modularity* rather than domain specificity. Briefly, the connec-

tion between the two is that domain specificity is one of the chief characteristics of modularity: all modules are domain-specific, though not all domain-specific structures are modular (see section 2 for more on this). Insofar as arguments for the claim that modules are innate trade on the domain specificity of modules, they will effectively be addressed in what follows. However, it appears that some of the arguments for the innateness of modules rely on the alleged universality or species-specificity of these modules (see section 4 for an example).

2. INNATENESS AND DOMAIN SPECIFICITY

An innate mental state cannot simply be described as one found in the cognizer at birth, since everyone would agree that many innate states are manifested well after birth. Nor are innate states somehow available to be read off from the agent's genes, since it is questionable whether anything can be read directly from the genes, much less a complex cognitive capacity or a contentful mental state. Moreover, they cannot be distinguished by the fact that they are "internal," for in some loose sense so are all mental states. How then are we to characterize innate mental states? The most promising attempt is a dispositional account, which says that a mental state is innate to the extent that it would arise as a result of an impoverished environmental stimulus. An innate mental state or cognitive capacity is one that would be *triggered* by the environment, and the weaker the trigger the more innate the state. If the content of the output clearly exceeds that of the input, then we are justified in claiming that the balance is supplied by the cognizer. If nothing in the agent's developmental history could account for the remainder, then the cognitive endowment must have an innate component. There may be no ready way of measuring informational content, but I will argue in due course (see section 5) that there are methods of estimating the content of the input relative to the output, which enable us to make the judgment with some confidence. This dispositional account clearly brings out the relevance of what might be considered the ur-argument for innateness: the poverty of the stimulus.[2]

Having characterized innateness, it is time to say something about domain specificity. To say that a cognitive capacity or set of beliefs or collection of ideas is domain-specific is to say that

it is dedicated to solving a restricted class of problems relating to a certain field of inquiry or range of phenomena. The cognitive science literature is rife with candidates for domain-specific capacities. It has been claimed, for example, that there are cognitive capacities that pertain specifically to the domain of *language*, others to *social relations*, yet others to *natural history* (or folk biology), a *theory of mind*, *tool-making*, *music*, and so on. It is not a trivial matter to say what constitutes a domain. Elsewhere, I have proposed that in specifying the domain of a scientific theory, one needs to refer to a set of *interests* as well as to a spatio-temporal level.[3] Similar considerations may apply here and care may have to be taken in delimiting domains, though in practice this does not seem to be a controversial matter in cognitive research.

But more crucial than the delimitation of a *domain* is the explication of *specificity*. There is obviously something suspect about describing a single concept as domain-specific, since it is trivially true that any given concept pertains to a specific domain, or at most a small number of such domains. Thus, domain specificity is more properly an attribute of clusters of concepts, sets of beliefs, or whole cognitive capacities. Moreover, such concept clusters must in some sense function together as a unit or have a certain coherence. To say of a capacity or cluster of concepts that it is domain-specific cannot just consist in saying that it pertains to a certain domain. For then it would be a trivial matter to claim that cognition is domain-specific: there is clearly a sense in which we can parcel out our cognitive abilities into domains for purposes of analysis, even though they may not themselves be organized in domains. In short, domain specificity must have a certain amount of *psychological reality*, if it is not to degenerate into the trivial claim that information itself (wherever it is located) can be compartmentalized in principle. What more is being claimed? The additional claim made is that this capacity is relatively isolated from other cognitive capacities, in such a way that the skills and abilities in this domain are not easily *generalizable* to other domains. In other words, the doctrine of domain specificity acquires psychological reality if it is understood as a claim about the lack of generalizability.

While this may not be a universally held view, lack of generalizability is a common theme in the literature concerning domain

specificity. For example, Cheney and Seyfarth state explicitly that the "domain-specific hypothesis posits that natural selection may have acted to favor complex abilities in the social domain that are, for some reason, less easily extended or generalized to other spheres" (1985, p. 188). To illustrate, they report that, "Within the social group, the behavior of monkeys suggests an understanding of causality, transitive inference, and the notion of reciprocity. Despite frequent opportunity and often strong selective pressure, however, comparable behavior does not readily emerge in dealings with other animal species or with inanimate objects" (1985, p. 197). Since this information cannot be generalized, they conclude that vervet monkeys "make excellent primatologists but poor naturalists" (1985, p. 187). Other writers agree broadly with this characterization of the thesis of domain specificity.[4]

It is important to distinguish the doctrine of domain specificity from that of modularity. The thesis of modularity, which holds that the human mind consists (at least partly) of a number of modules, is more comprehensive than domain specificity. Following Jerry Fodor's (1983) original formulation, modules are thought to be not just (1) domain-specific, but are also posited (2) to process items automatically and in a mandatory manner, (3) to be inaccessible to consciousness, (4) to be fast, (5) to be cognitively impenetrable (for example, resistant to being unlearned), (6) to process "shallow" or highly salient features, (7) to have a fixed neural architecture, (8) to have specific breakdown patterns (as in aphasia, agnosia), and (9) to have a fixed ontogeny (standard pace and sequence of development). Clearly, modularity is a more comprehensive notion than domain specificity, and the former includes the latter. Thus, in saying that domain specificity must have some psychological reality, I am not making the stronger claim that domain-specific capacities must be modular.[5] However, as noted above (section 1), at least some of the arguments for the innateness of modules seem to rely on the domain specificity of modules to argue for their innateness.

3. SIMPLE ATTEMPTS AT LINKAGE

Having given characterizations of innateness and domain specificity, it is time to ask: Why might one generally associate what is innate

with what is domain-specific? Intuitively, the two ideas do not seem to be intrinsically linked. It is conceivable that our innate endowment consists largely or entirely of general and non-specific abilities, but that it is quite substantive nevertheless. Conversely, it is easy to imagine that domain-specific abilities may be acquired by learning, and many of them surely are so acquired. Prima facie, therefore, the two doctrines would appear to be independent. In this section, I will examine three fairly simple arguments for inferring domain specificity from innateness, and will try to show why each of these arguments fail. Then in the following section, I will respond to some more sophisticated arguments for the same conclusion, as well as its converse. After dismissing these arguments, it will become possible to explain the actual link between innateness and domain specificity.

One possible attempt to forge a connection between innateness and domain specificity might proceed as follows. Note first that if one says that an agent has a substantial innate cognitive endowment, then that implies that the agent has certain specific dispositions that restrict its resultant cognitive competence in some definite ways. Thus, it seems plausible that these restrictions are ones that dictate that the cognizer's competence is geared to a certain delimited domain. After all, what would it be to restrict our cognitive abilities in some way if these restrictions did not limit those abilities to dealing with certain specific problems and not others? Therefore, it might be argued that the mere fact that innate constraints are placed on our ability to apprehend certain features of the world around us implies that our cognitive competence is restricted to specific domains. However, this assessment is surely mistaken, for the restrictions that might constrain our cognitive capacities and the resulting capacities need not pertain to specific domains. It may be the case that our cognitive capacities are restricted *across* different domains. This would be the case if, for example, we are innately constrained to use certain rules of inference and not others, or to make some inductive generalizations and not others. These would be innate dispositions that restrict our competence across a range of domains.[6] Equally, we may have innate dispositions that act as cognitive constraints within a given domain, where that domain is not itself wholly innate. So it seems clear that our innate capacities

may either be inter-domain or intra-domain and need not be domain-specific, after all. The mere fact that there is an innate restriction on what we can acquire is not sufficient to imply that what is acquired is acquired as a result of capacities specific to a certain domain.

Another attempt to make a link between innateness and domain specificity might proceed by basing itself on the claim that concept acquisition and belief fixation are holistic processes. The holism of concept acquisition is a relatively uncontroversial doctrine and one that ought not to be confused with semantic holism. The claim is not that concepts and beliefs get their meanings holistically from other concepts and beliefs, but merely that they are acquired in clusters. Thus, for instance, the child does not acquire the concept *baby* on its own, but acquires it along with such concepts as *animal, alive, dead, living thing*, and *body*.[7] If such claims are generally true, it might be argued that they show that there is a close link between innateness and domain specificity. If innate concepts are triggered by experience, then we should expect them not to be triggered piecemeal, but in clusters, which in turn pertain to domains. But there are two debilitating problems for this attempt to show the relation between the two claims. The first is that not all concept clusters constitute domains, or even large chunks of domains. The concept clusters that are acquired together may actually cut across domains, or they may be small fragments of domains. The second is that, to say that certain concepts are acquired together is not to say that they function together as a unit, or that they constitute a domain understanding of which is not readily generalizable to other domains.

A somewhat more promising attempt to forge an intrinsic connection between innateness and domain specificity might proceed by making use of Stephen Stich's distinction between beliefs and "subdoxastic states." The latter are mental states that "play a role in the proximate causal history of beliefs, though they are not beliefs themselves" (1978, p. 499). Subdoxastic states are supposed to be part of the causal process leading to belief formation. As a paradigm example of such states, Stich mentions psychological states that are responsible for our grammatical intuitions, or our judgments that a newly encountered sentence is grammatical or ungrammatical (as the case may be). Though we know little about the mechanism of belief formation in this case, he says it is plausible to speculate

that it exploits a system of psychological states storing information about the grammar of the subject's language. These states are not beliefs, but play a role in causing our grammatical beliefs (1978, pp. 501–502). Moreover, Stich hypothesizes that such subdoxastic states have two criterial features: 1) they are unconscious, and 2) they are not inferentially integrated with our system of beliefs.

This distinction can now be used to shed some light on the nature and etiology of innate mental states (though Stich himself does not use it for this purpose). If innate mental states are merely triggered by environmental cues and are not acquired by learning like many ordinary beliefs, then this implies that they are not typically caused by other mental states, though they can serve as the causes of other mental states. This suggests that they are not integrated with other mental states in the usual way. Generally speaking, beliefs are integrated with other beliefs (as well as desires, fears, intentions, actions, and so on) by causing them and being caused by them in turn, and these causal relations typically run in parallel with inferential relations. For example, my belief that fresh almonds are available in spring, and my belief that it is now spring, generally cause my belief that fresh almonds are available now. By contrast, innate mental states seem somewhat causally and inferentially isolated from other mental states, for although they are causes of other mental states they do not seem to be caused by them. Moreover, this kind of inferential isolation or informational encapsulation seems closely related to domain specificity in the sense already determined, namely lack of generalizability. For it is safe to say that generalizability is a form of inferential integration. This would forge a route from innateness to domain specificity: innateness implies subdoxasticity, subdoxasticity implies lack of inferential integration, and lack of inferential integration implies lack of generalizability (which is how we have understood domain specificity).

Though tempting, this line of argument is not ultimately successful, for as Fodor has pointed out in a different context, there are paradigm cases of subdoxastic (and putatively innate) mental states that are not informationally encapsulated or unintegrated with other mental states. He cites the case of our "subdoxastic views about inductive and deductive warrant; for example, one's

subdoxastic acquiescence in the rule of modus ponens" (1983, p. 85). Though these mental states are indeed unconscious, Fodor draws attention to the fact that they are "paradigms of promiscuous and unencapsulated mental states" (1983, p. 85). Thus, there are prominent examples of subdoxastic states that are not isolated from other mental states, but are indeed the very model of inferentially integrated states. So even if all innate mental states are subdoxastic (which is a questionable claim in itself, since we surely want to admit the possibility that some innate mental states are fully conscious when manifest), this does not enable us to conclude that they are all informationally encapsulated or inferentially isolated from other mental states. Finally, if they are not isolated, then we cannot conclude that they are not generalizable, and there is no reason to think that they are domain-specific.

4. SOPHISTICATED ATTEMPTS AT LINKAGE

In the previous section, I examined three fairly simple attempts to make the connection between innateness and domain specificity. Having dismissed these arguments, I want to examine some more sophisticated attempts to argue that innateness and domain specificity are generally linked. The first argument, due to Fiona Cowie, goes further than the previous arguments in concluding that the innateness claim is itself insubstantial; she goes on to say that it can be made more substantive in reinterpreting it to be about domain specificity. The next two arguments are inspired by remarks made by George Botterill and Peter Carruthers. Though they are not committed to them in the form I have given them, the arguments are worth discussing because they seem to be implicit in some of the literature in cognitive science.

In line with a number of other authors, Cowie (1999) stresses that empiricists and nativists agree that both experience and innate endowment play critical roles in our mental development. Indeed, she goes further and concludes that when phrased in literal language, the nativist-empiricist dispute dissolves: "Force the warring parties to lay down their similes and negotiate the disputed territory in plain language, and there seems precious little they disagree about" (1999, p. 17). Although she tries out the view that the disagreement is over

whether which factors (internal or external) "play a more important role" in the genesis of our ideas, she rejects this interpretation of the controversy as "ultimately unhelpful" (1999, pp. 21–22). The reasons Cowie gives for this ruling are twofold. First, (some) nativists have not just disagreed with empiricists as to how to explain the phenomena of acquisition, but also as to whether such an explanation is possible at all. Second, she says that seeing the dispute as being about a matter of degree does little to dispel the impression that it is an insubstantial disagreement (1999, p. 22).

What then, is the empiricist-nativist dispute about? Cowie claims that arguments based on the poverty of the stimulus "seek to establish a 'gap' between what in the way of information about the world is provided by sensory experience and what we end up knowing" (1999, p. 31). The nativist proceeds to close the gap by enriching the resources held to be available to the learner. This can be done either through general-purpose abilities or domain-specific capacities. The former would posit an extremely high-powered faculty of induction that enables learning in the face of impoverished experience. But this "power-induction" hypothesis suffers from two fatal drawbacks, according to Cowie. First, it is ad hoc and obscure. Second, and more damaging, it falls afoul of parsimony considerations. The resources of the learner should only be increased as much as needed to account for the acquisition of the items in question. Since nativists acknowledge the adequacy of empiricist learning mechanisms for some concepts and beliefs but not others (for example, the concepts *red* or *hot*, but not *God* or *equal*), it would be explanatorily profligate of them to postulate a general-purpose learning mechanism such as power induction. Rather, special faculties should be postulated for those concepts and beliefs that they think the empiricist cannot account for. But such a piecemeal approach, according to Cowie, amounts precisely to the postulation of domain-specific faculties. Therefore, Cowie concludes: "On the nativist view, some concepts and beliefs are acquired by means of special-purpose, or task-specific, mental faculties" (1999, p. 40).

This argument is not sufficient to establish that the empiricist-nativist debate is, or indeed that it should be, about domain specificity. Granted, nativists hold that certain concepts and beliefs cannot be acquired through standard empiricist learning mechan-

isms such as induction, abstraction, and so on. Granted also that the acquisition of specific concepts requires the postulation of specific mechanisms. But this still does not show that they need be *domain*-specific. To use one of Cowie's examples, if nativists argue that the concept *God* is innate, this does not necessarily commit them to positing a capacity specific to the acquisition of religious or spiritual concepts. We may be innately predisposed to acquire the concept *God* without having a capacity to acquire other concepts from the same domain. The concepts and beliefs we have acquired on the basis of impoverished stimuli may not be clustered in domains. Moreover, they may involve some concepts and beliefs derived from specific domains, but exclude closely related ones in those same domains. In addition, we may have a plethora of innate concepts, very few of which are drawn from the same domain. Therefore, it seems that the nativist-empiricist dispute should not be taken to be about domain specificity.

Earlier, I argued that claims about the innateness of contentful mental states should be understood in terms of the informational content of the input relative to the output (see section 2). Cowie is not completely dismissive of this point. She discusses the issue of the relative contribution of the internal and external factors for any given psychological state, and does seem to admit that a quantitative dispute is not entirely without substance. She allows that this issue can be a substantive one in cases in which the explanandum is unitary, the question is very narrow and well defined, and the dispute is susceptible of definitive empirical resolution. In such cases, she says, the nativist-empiricist dispute concerns the particular ways that particular causal elements contribute to particular causal processes (1999, pp. 23–24). Still, she thinks that more was at issue in the historical debate, and that there is a lot more to the nativism controversy, as already mentioned above. In response, one can readily agree that there may have been more to the historical debate (in fact there certainly was, since it was largely about justification rather than acquisition). In addition, she argues convincingly that many nativists have been and continue to be frankly pessimistic about the very possibility of giving a satisfactory account of the process of acquiring ideas and beliefs. If Cowie is right, then this appears to have been, and still is, a strand in nativist thinking. But it

does not follow that what is left of the innateness debate is the issue of domain specificity.[8]

In deriving the following two arguments from Botterill and Carruthers, two caveats must be registered. First, Botterill and Carruthers are primarily concerned to explore the connection between innateness and *modularity*, not domain specificity. But they make it clear that the key feature of modularity with which they are concerned is that of domain specificity. Second, it should be emphasized that they do not use these arguments for saying that innateness and modularity always go together or that there is an intrinsic link between them; at best they seem to think that the research programs investigating each phenomenon are "mutually supportive." But both arguments bear a close relation to (largely implicit) arguments to be found in the cognitive science literature, so they are worth exploring for that reason.

The first argument vetted by Botterill and Carruthers can be expressed very briefly. They suggest that it is implausible to maintain that "the same detailed modular organization should be replicated in different individuals simply by the operation of general learning processes upon diverse experiential inputs" (1999, p. 56). The argument is based on the premise that the same detailed domain-specific modules develop reliably in different individuals in the species. It also depends on the premise that it is implausible that this should happen as a result of general learning mechanisms operating on diverse inputs. The conclusion is that this happens as a result of an innate endowment general to the species at large. Therefore, what is modular is also innate.

The controversial premise is the second one (the first is presumably a well-established empirical finding). I would suggest that it derives its plausibility from the crucial assumption that domain-specific modules develop *in all members of our species* (not just in some individuals). To see this, notice that grounds for positing innateness would not be nearly so compelling if it had to do with a chess-playing module that develops in a select few individuals. Suppose that experimental evidence showed that a domain-specific capacity were to develop reliably in all and only expert chess players. It would be plausible to argue that this module is likely to be a natural response to the particular kinds of stimuli with which these

individuals were confronted: practice, coaching, playing games, reading books, and so on. By contrast, if a cognitive capacity develops reliably in *all* members of our species, that may give us some grounds for thinking that it is innate. But the reason for positing innateness here is not modularity or domain specificity, but rather that it shows up in all members of the species. Therefore, the argument might succeed in going from modularity to innateness if this is supplemented with a hefty additional assumption (universality in the species); without it, it is powerless to draw a direct connection between the two claims.[9]

The preceding argument attempted to derive the conclusion that what is modular is typically innate. The argument now to be considered attempts to argue for the converse, that what is innate is modular. To make this case, Botterill and Carruthers note that there is adaptive advantage to having cognition structured in a modular fashion. Then they state: "if that is so, then the adaptive advantage will need to be replicated through genetic transmission of instructions for the growth of modular systems" (1999, p. 56). Moreover, what is genetically transmitted is innate; therefore there is adaptive advantage to what is innate being modular.

In order for this argument to establish that there is an intrinsic link between innateness and modularity, it would have to be the case not only that it would be adaptive for some cognitive capacities to be modular, but rather for cognition to be generally or massively modular. If the only adaptive cognitive structures are modular ones (so that they are the only ones likely to be genetically programmed), then we could expect all innate capacities to be modular (and hence domain-specific). But it is far from clear that this is so; in fact, it is fairly certain that there are plenty of adaptive *non*-modular capacities, particularly capacities that do not have a domain-specific nature. Unless we also had domain-general, non-modular capacities (rules of inference, inductive algorithms, capacities for abduction, and the like), we would not have been able to occupy the particular ecological niche that we do. Moreover, there is another flaw in this argument, namely that we cannot assume that everything that is adaptive is *realized in the organism* (indeed, we cannot even assume that everything that is realized is adaptive). Therefore, the argument

fails to establish the conclusion that our entire innate endowment is modular or domain-specific.

It should be emphasized that Botterill and Carruthers do not make a commitment to the thesis that there is an intrinsic link between innateness and domain specificity. But these arguments, particularly the latter one, seem to be implicit in some of the literature. In particular, the second argument seems to depend on what has been called the "Massive Modularity Thesis," which states that the mind is *massively* or *predominantly* modular, and that there is an adaptive reason for this.[10] But support for this thesis has not been forthcoming and it has come in for a great deal of criticism.[11] In the absence of further evidence or argumentation, it can safely be concluded that there is no reason to see an intrinsic link between innateness and domain specificity. This leaves us with the question, Why the widespread association between innateness and domain specificity? The reason derives from the fact that the main argument for innateness is the one from the poverty of the stimulus. Although it may seem as though there is no direct way of assessing the impoverishment of input relative to output when it comes to cognitive states, I will argue in the following section that there are various indirect ways of doing so, some of which implicate domain specificity.

5. EVIDENCE FOR INNATENESS

Even though there may be no widely accepted way of measuring relative informational content, we need not let our judgment on specific cases wait upon the emergence of a general standard of measurement.[12] Rather, we can look at the evidence in a particular instance of belief acquisition and try to determine whether the input (experience) obviously outstrips the output (competence). If we focus on specific mental items and examine the nature of the thinker's experience, we may be able to rule in some cases that the innate contribution is negligible, substantial, or somewhere in between. In addition, we may be able to make comparative claims that a certain mental capacity contains a larger innate contribution than another. In this section, I want to indicate some ways in which indirect assessments of informational content can be made with

some confidence. It will turn out that this will clarify the nature of the relation between innateness and domain specificity.

In light of the fact that the poverty of the stimulus is the main argument for innateness, why is there a perceived connection between innateness and domain specificity? I would diagnose it as follows: for a given specific domain, it is easier to rule out explicit instruction or extensive experience, and consequently, easier to say that there is a decisive contribution from the mind. What forges a connection between domain specificity and innateness is the fact that with domain-specific beliefs, it is *easier to determine* whether or not they are innate. The existence of domain-specific concepts or beliefs in a cognizer without a history of extensive exposure to explicit instruction in that domain (which is a rather impoverished history relative to that domain), serves as a good indication that those beliefs are at least partly innate. That is why domain specificity is sometimes taken as a *sign* of innateness: explicit teaching is easier to gauge in these cases.

This conjecture can be supported by reflecting on the difficulties posed by an attempt to ascertain whether certain domain-general abilities are innate, for example creativity, inductive inference, abduction, and the like. Given that exposure to and instruction in such tasks is likely to come from various different quarters in a plethora of different guises, it will be relatively difficult to determine the degree of innateness, if any, of such capacities. Moreover, even when it comes to domain-specific abilities, we have more extensive exposure to some domains than to others, making it correspondingly more difficult to rule out learning in the former. This will become clearer if we distinguish two different cases: 1) domains for which we are constantly awash in information from the environment, and 2) domains for which the environmental contribution comes in discrete packets from specific quarters. It is safe to say that researchers interested in determining the degree of innate contribution made by our minds have an easier job in the second case than in the first.

In the first case, domains in which the environmental contribution is not easily circumscribed and does not come neatly packaged, researchers have a relatively difficult task in ruling out explicit learning. For example, researchers working on infants' under-

standing of broad features of the physical domain find it difficult to dismiss outright the possibility that these abilities are acquired as a result of extensive exposure to events in the physical world. Nevertheless, they can *compare* different aspects of infants' apprehension of basic physical principles in order to try to determine which aspects have a more substantial innate endowment. Given that infants have an earlier understanding of the continuity and solidity of objects (at least as early as $2^1/_2$ months) than of the effects of gravity and inertia (6 months), Spelke (1991) has conjectured that infants have a more substantial innate endowment when it comes to the former than the latter. She bases this conclusion on the fact that infants are roughly *equally* exposed to these different aspects of the physical domain: "Given the limited perceptual and exploratory capacities of young infants, the perceptual evidence for the effects of gravity and inertia would appear to be at least as great as the evidence for solidity and continuity, and probably greater" (1991, p. 161). Effectively, therefore, *within* the physical domain, the environmental contribution cancels out, enabling us to make a comparative assessment of the innate contribution.

By contrast, when it comes to the second case, those domains that are defined more narrowly and in which the environmental contribution is easier to pinpoint, it is easier to say whether the stimulus contains all or most of the information which gets incorporated into our mental states, or whether it seriously underdetermines this information. Despite the paucity of documented cases of lives lived completely devoid of language, there are numerous instances in which we can safely rule out exposure to certain aspects of language use, and these are often cited in the literature when arguing for a substantial innate contribution. To use just one example, there are documented cases in which deaf or hearing-impaired children have developed a syntactically consistent sign language, despite the fact that they had not been exposed to one. In these cases, the children's parents were either not hearing-impaired or had not learned sign language at an early stage, so that their command over the structural or combinatorial aspects of the language was significantly worse than native users of sign language (e.g. American Sign Language, ASL). In this case, the children's competence can be ruled to be rich relative to their parents' input, which is correspondingly impover-

ished. We have little problem ruling out input from other sources, given the domain-specific nature of linguistic information.[13] When dealing with such cases, it becomes easier to determine that the input from the environment did not contribute substantially to the competence of the thinker, and we need not rely specifically on comparative judgments. This is more the case for a domain like language than it is for the physical domain, where it is harder to rule out such exposure, and even harder for a cognitive ability that does not concern any particular domain.

Thus, when it comes to determining their source, domain-specific abilities are more conducive to an assessment of the relative strength of the innate and environmental contributions. But not all domains are equal in terms of the quantity and quality of our exposure to them, and this assessment is more straightforward for delimited and well-defined domains. However, that does not mean that what is innate is always specific to certain domains or that domain-specific capacities are always innate, just that it is easier to determine the degree of innateness when it comes to domain-specific capacities.

Bearing in mind that the poverty of the stimulus is the dominant argument for innateness, we can say that the reason the innateness thesis is often closely associated with that of domain specificity is that there is an *evidential* or *epistemic* connection between them. In the absence of a precise and direct way of measuring the relative informational content in the trigger (input) and the cognitive competence (output), we must rely on indirect and comparative measures. This is more readily done for well-defined domain-specific abilities (e.g. language) than it is for generalized cognitive capacities (e.g. abduction), since we can more easily gauge the amount of explicit learning or relevant experience in the former case than the latter. It is also more feasible within specific domains (within the physical domain), where the extent of environmental contribution cancels out, enabling us to make a comparative estimate of the degree of innateness.

CONCLUSION

I took as my starting point in this paper a widespread association between two seemingly disparate theses: innateness and domain

specificity. I went on to consider various arguments for the conclusion that, given some of the key characteristics of these phenomena (perhaps in addition to other uncontroversial assumptions) there is a general or habitual link between them. After showing that these arguments fail or that they involve additional controversial assumptions, I went on to propose a diagnosis of the reason that innateness and domain specificity are often associated in cognitive science. The reason is that it is simply easier to tell in the case of domain specific capacities whether and to what extent they are innate.

NOTES

[1] The claim seems to be applied to concepts and beliefs as well as capacities and mechanisms. It has various different versions in different authors (e.g. domain-specific mechanisms are generally responsible for acquiring innate beliefs, innate concepts typically belong to domain-specific capacities, innate constraints on cognition always lead to the formation of domain specific mechanisms, etc.). The following discussion is neutral among these different theses.

[2] This account is based on the "triggering model" of innateness proposed in Stich (1975). It may be objected here that if innateness is understood in this manner, then the poverty of the stimulus argument ceases to be an argument *for* innateness and becomes instead an explication *of* innateness. Surely, it may be said, we should have an independent understanding of innateness, and then argue for it on the basis of the poverty of the stimulus. I would argue that this is a common feature of dispositional concepts whose underlying basis has yet to be discovered. Until such time as the grounds of the disposition are adequately known (if indeed they can ever be directly known) it is legitimate to explicate innateness by saying that a mental state is innate to the degree that its content exceeds that of the environmental stimulus. A full justification of this conception of innateness is beyond the scope of this paper. The important point is that this does not trivialize the argument from the poverty of the stimulus, since it is a substantive issue whether and to what extent the stimulus is in fact impoverished in any given case (see section 5).

[3] For details, see Khalidi (1993, 1998).

[4] In a recent discussion, Fodor characterizes domain specificity by citing a hypothetical example. He cosiders "a mechanism that assesses inferences by reference to a rule of modus poens formulated *with less than complete generality* . . ." (2000, 61; original emphasis). For example, he imagines a principle of modus ponens that applies only to reasoning about the number 2. What makes this rule domain specific is that it does not generalize.

[5] See Samuels (1998) for a domain-specific model of cognition that is not modular. He calls this the Library Model of Cognition: ". . . to the extent that

the human mind contains domain-specific structure, most of this structure comes in the form of innate, domain-specific bodies of *knowledge* which are only operated on by *domain-general* computational devices" (1998, pp. 583–584; original emphasis).

[6] One might wish to talk about *rationality* as a distinct domain. But if one does, then one has effectively abandoned the notion of a domain, since inferential rules are paradigmatically generalize across domains. Results concerning our tendency to make certain inferences and not others, or to make incorrect inferences in certain contexts, have been widely reported in the psychological literature. For a philosophical discussion of their implications, see Stich (1990).

[7] See Carey (1985) for more on this particular case.

[8] Significantly, in later chapters of her work, Cowie herself does not always consider that the debate about nativism devolves into one about domain specificity (see especially chapters 7–9). Indeed, she considers and evaluates the two theses (innateness and domain specificity) separately, and shows clearly that they are independent of one another. She defines "weak nativism" as a cojunction of the two doctrines, and makes it clear that one can deny one without denying the other (1999, p. 183).

[9] Indeed even adding the assumption of universality may not be enough to establish innateness; the point is merely that the argument has no hope without it.

[10] Tooby and Cosmides put forward a model of the mind according to which "the human mind consists of a set of evolved information processing mechanisms . . . many [of which] are functionally specialized to produce behavior that solves particular adaptive problems. . .; to be functionally specialized, many of these mechanisms must be richly structured in a content-specific way . . ." (1992, p. 24).

[11] The attack was spearheaded by Fodor (1983) and is taken up again in Fodor (2000).

[12] Note that informational *content* is not readily measured; bare information can be and is measured according to the principles of mathematical information theory. But there is a large gap between information in the latter sense and full-blown semantic content.

[13] For further discussion, see Landau (1998, pp. 586–587), Cowie (1999, pp. 303–305), Pinker (1994, pp. 36–39), and Botterill and Carruthers (1999, p. 54). Despite their rather different disciplinary and theoretical perspectives, all of these authors acknowledge that the input is impoverished relative to the output in such cases.

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