PART I

INNATENESS, GENES, AND THE POVERTY OF THE STIMULUS

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Is Innateness a Confused Concept?

1 Introduction

Innateness hypotheses have played a central role in the development of cognitive science and have been invoked to explain a broad array of psychological phenomena, including theory of mind, arithmetic, folk physics, and language acquisition. Despite the prominence of such hypotheses, however, it would be misleading to suggest that nativists have had things all their way. On the contrary, their views have been subjected to sustained criticism and, indeed, roundly rejected in many quarters of the cognitive science community.

Although challenges to nativism vary considerably in detail, most treat the issues as thoroughly empirical ones, where innateness hypotheses are to be rejected on the grounds that they are unwarranted by the data. In recent years, however, the very concept of innateness has increasingly come under attack from those—such as developmental systems theorists—who argue that it is a "fundamentally confused concept" (Griffiths, 1997, 2002; see also Bateson, 2000; Oyama, 2000a, 2000b). According to this conceptual challenge, the problem with nativism is not merely that it yields empirically unwarranted hypotheses, but also that the whole tradition is rotten to its conceptual core. Proponents of the challenge thus maintain that cognitive science should follow the example of much biology—where talk of innateness has fallen into disrepute—and cease using the concept altogether.

The conceptual challenge, if it could be sustained, has radical consequences for cognitive science. Not only would it undermine nativism in its various forms, it would also threaten the main empiricist and constructivist alternatives as well, since they, too, presuppose the coherence of the innateness concept (Cowie, 1999; Elman et al., 1996). Advocates of such views almost invariably treat the assessment of innateness hypotheses as a substantive empirical matter but maintain that putative, innate structures are in fact acquired as opposed to innate. Moreover, they almost invariably assume there are some innate cognitive structures: structures whose existence

is required for learning to proceed in the first place.[1] But all this presupposes the coherence of the innateness concept. Thus the conceptual challenge is as much a complaint against mainstream empiricist views as it is against nativist ones.

So, if the conceptual challenge could be sustained, it would have serious implications for cognitive science. Fortunately, it cannot be sustained. Or so I will argue. I do not claim that all uses of the term "innate" are untainted by confusion, or even that cognitive scientists are seldom guilty of confusion when discussing innateness. But I do maintain that the main argument invoked by advocates of the conceptual challenge—what I call the Argument for Confusion—is unsatisfactory and, moreover, that it is quite possible to make sense of innateness claims, at least as they figure in cognitive science.

Here's an overview of things to come. In section 2, I set out the Argument for Confusion, which seeks to show that the concept of innateness is confused because it confounds several independent properties. In section 3, I show that this argument is inconclusive by highlighting two ways in which innateness might be associated with a range of distinct properties without confounding them. This, I maintain, suffices to show that the Argument for Confusion is inconclusive. Nevertheless, it leaves an important challenge unaddressed: to explain in detail the relationship between the various properties associated with innateness and innateness itself. In section 4, I address this issue, and in doing so, seek to show that the concept of innateness, at least as it figures in cognitive science, is not a confused one. This leaves a residual puzzle: If the concept of innateness is *not* confused, then why are debates over innateness in cognitive science often accompanied by confusion? I conclude, in section 5, with a brief discussion of this matter.

2 The Argument for Confusion

Advocates of the conceptual challenge draw inspiration from the history of science—in particular, the way talk of innateness fell from grace in twentieth-century biology. But the core objection is no mere induction from past cases; instead, it turns on claims about the properties of the concept INNATE.[2] Though different versions of the argument have been formulated by a number of prominent theorists (Bateson, 2000; Oyama 2000a), Paul Griffiths has expressed the key concern as well as any; and in what follows, I focus on his formulation. My comments apply, *mutatis mutandis,* to other versions of the argument.

The core of Griffiths' argument is easily stated. INNATE is a "fundamentally confused concept," it is claimed, because "it confounds under one term several independent properties," including the following:

1. Having an (adaptive) evolutionary explanation
2. Being insensitive to variation in "extrinsic" factors in development

1. The distinction between nativism and nonnativism is not that the latter eschews innate structure entirely, but merely that it posits less. As Quine observed long ago, even "the behaviorist is knowingly and cheerfully up to his neck in innate mechanisms" (Quine, 1969).

2. In what follows, I adopt the notational convention of using capitals to name concepts (e.g., INNATE), italics to name properties (e.g., *innate*), and quotation marks to name words ("innate").

3. Being present at birth or inborn
4. Being "universal" in a couple of senses
   a. Being pancultural (i.e., present in all human cultures)
   b. Being monomorphic (i.e., a trait that takes only one form among members of a species)
5. Not being acquired by learning (Griffiths, 1997).

Call the above *I-properties*: *I* for innate and for independent. According to Griffiths, I-properties are not merely logically independent but also *empirically dissociable*, in that there are many actual cases where they occur separately from each other. So, for example, there are adaptations—such as emotion recognition in macaques—whose development is sensitive to environmental factors (Griffiths, 2002; Mason, 1985). Similarly, there are many evolved traits—such as secondary sexual characteristics—that are not present at birth. And so on.

Griffiths' complaint is that our concept of innateness is confused because it somehow *confounds* (or conflates) these empirically dissociable I-properties. As we will soon see, it is far from clear precisely what this amounts to. But the rough idea is that I-properties "get bundled together in the innateness concept" in such a way as to produce various theoretically undesirable outcomes (Griffiths, 1997). In particular, because INNATE confounds I-properties, it gives rise to illicit inferences in which a trait is first said to be innate because it has one I-property, and is then assumed, without sufficient warrant, to possess others (Griffiths, 1997, p. 60). Griffiths' flagship example of this phenomenon comes from classical ethology, where Konrad Lorenz and his colleagues freely drew inferences from a trait's possessing one I-property, such as having an adaptive evolutionary explanation, to its possession of others (e.g., universality or insensitivity to environmental factors). Yet Griffiths does not think this is an isolated example. On the contrary, he maintains that discussions of innateness are replete with similar illicit inferences and, moreover, that the confusion they generate has had an "unfortunate" (p. 186) and, indeed, "pernicious" (p. 192) effect on theories of cognitive development.

What conclusions should we draw from this? According to Griffiths, the conclusion is not merely that the word "innate" is somehow problematic. Rather, the problem is with the concept of innateness itself. INNATE is a "fundamentally confused" concept that induces poor inferential practices and confusion in thought. Unsurprisingly, in view of this assessment, he suggests that the concept of innateness should play no serious role in cognitive science.

3 Responding to the Charge of Confusion

There is much in Griffiths' discussion that is right. First, Griffiths is surely right that I-properties are in some way *associated* with the notion of innateness. Second, these I-properties are, as he claims, empirically dissociable from each other. Third, theorists are apt, as he suggests, to infer without sufficient warrant from the presence (or absence) of one I-property to the presence (or absence) of others. Finally, Griffiths is right that debates over innateness in cognitive science frequently

incorporate hefty amounts of confusion. In what follows, I assume these points as common ground between proponents of the conceptual challenge and myself.

For all that, the charge of confusion fails. To show that INNATE is a confused concept, it is not enough to show merely that various independent properties are *associated* with the concept. If it were, then almost every concept should be rejected as confused. Rather, it needs to be shown that INNATE *confounds* these properties under a single term in some way that merits the charge of conceptual confusion. In this section, I argue that Griffiths fails to establish this conclusion since, for all he shows, there are at least two relations that could obtain between I-properties and INNATE which would in no way be indicative of confusion. Before doing so, however, a few points are in order concerning the notions of confounding and confusion.

3.1 *Confounds and Confusion*

INNATE, we are told, is confused because it confounds several I-properties under a single term. If true, this suggests that (a) confounding is supposed to involve some relation between properties and concepts; (b) this relation holds between INNATE and I-properties; and (c) the obtaining of this relation suffices for a concept's being confused. But beyond this, it is far from clear what the relation is supposed to be since Griffiths, perhaps wisely, says little on the matter. I say "wisely" because it seems to turn on various vexed issues about the nature of concepts. In view of space considerations, I propose to give the matter fairly wide berth, and my central objections to the Argument for Confusion will not turn on any very specific construal of what confounding is. Even so, I want to make a couple of comments on the matter: one concerning what confounding is *not*, and another concerning the sort of relation it needs to be if the inference from confounding to confusion is to go through.

3.1.1 Confusion vs. Ambiguity. First, it is important not to conflate the claim that INNATE is confused because it confounds I-properties, with the claim that the *word* "innate" is ambiguous.[3] Failure to do so gives the conceptual challenge an unwarranted air of plausibility. This is because, while the charge of confusion is unwarranted, there are excellent reasons to suppose "innate" is ambiguous:

(a) If lexicographers are to be believed, "innate" is used in nonscientific contexts in many ways (e.g., to pick out traits that are present at birth, that are inherited, and that are in some sense intrinsic (OED, 1989)).
(b) Different scientific enterprises use the term differently. For example, in genetics "innate" sometimes means genetically encoded (whatever, precisely, that means), while in immunology it is often used to denote those parts of the immune system that do not arise from previous infection or vaccination.
(c) Even within cognitive science, it is clear that different theorists have tried to stipulate meanings for the word "innate," and that these various stipulations differ in both extension and intension (Elman et al., 1996).

3. I use "ambiguous" to cover both standard cases of ambiguity and what linguists sometimes call polysemy.

Yet the claim that "innate" is ambiguous in no way implies that INNATE is a confused concept. Ambiguity can generate problems—such as fallacies of ambiguity—but it does not show that our concepts are confused.[4] The ambiguity of "bank" does not show, for example, that there is a confused BANK concept. Rather, in accord with the commonplace assumption that concepts are individuated by their contents, we are inclined to think that "bank" is used to express *different* concepts at different times, none of which need be in any way confused. *Mutatis mutandis* for "innate." What the ambiguity of "innate" presumably shows is not that INNATE is confused, but that there is no single innateness concept—no single concept corresponding to the term "innate"—but many.[5]

So, mere ambiguity does not support the claim that INNATE is confused. What may be less clear is that it may help in defending against the conceptual challenge. In arguing that cognitive science deploys a confused concept of innateness, proponents of the conceptual challenge tend to assume—though often only tacitly—that the cognitive scientists' concept is identical to ones used elsewhere. Griffiths, for example, freely talks of *the* concept of innateness and its application across a range of folk and scientific contexts. Similarly, Mameli and Bateson claim that "the concept of innateness is a part of folk wisdom but is also used by biologists and cognitive scientists" (Mameli and Bateson, 2006). Such pronouncements, literally construed, imply that there is a *single* innateness concept. It is then all too easy to infer from alleged confusions in folk thought—or classical ethology, for that matter—that cognitive scientists are also conceptually confused. But if "innate" is ambiguous, such inferences are unwarranted. Absent any argument to the contrary, we should be cautious not to assume that cognitive scientists express the very same concept by "innate" as either the folk or scientists in different disciplines. To do otherwise would be rather like assuming that physicists use the terms "temperature" and "weight" in the very same way as the folk, and then charging them with conceptual confusion just because the folk are confused. My point is that, though no doubt related, scientific concepts can differ from folk ones and, moreover, do so in ways that avoid confusion, even though the analogous folk notions do not.

3.1.2 *Confounds Need to be "Constitutive" of INNATE.* On reflection, there's a rather obvious reason why the ambiguity of "innate" fails to show that INNATE confounds different properties and, hence, is confused: It provides no reason whatsoever to suppose that the concept confounds anything. Much the same point applies to other items that might be said to be confused. So, for example, we might think that some of a person's beliefs about innate traits are confused because they confound different I-properties. But even if some sense can be made of the idea that a belief confounds different properties, it's far from obvious that this alone provides reason to conclude that the concept itself is confused. This would follow only if the confused belief was "constitutive" of the concept, in roughly the sense that it makes

4. In section 5, I return to the problems posed by ambiguity.

5. With this point in mind, let me note that from here on, INNATE will be used to name the concept used in cognitive science—whatever, precisely, that turns out to be.

INNATE the concept that it is. Otherwise, it seems possible for some of our beliefs to be confused and yet for the concept to be perfectly coherent.[6] Moreover, the point generalizes: If the inference from confounding to confusion is to go through, it must be something constitutive of the concept that confounds I-properties.

What might these constitutive aspects be? Views on this matter vary, depending on which theory of concepts one adopts. Consider, for example, an atomistic theory of concepts: one in which lexical concepts have no semantic structure (Fodor, 1998; Millikan, 2000). On such a view, the identity of the concept INNATE does not depend on its relations to other concepts, but on its relation to the world. Roughly, INNATE just is the mental representation causally related (in the appropriate way) to the property of *being innate*. In contrast, many theories of concepts—such as the theory-theory and classical theory—are "anatomistic" in the sense that the identity of a concept is at least partially constituted by its relations to other concepts and mental representations. On the classical theory, for example, INNATE has the structure of a definition in that it is composed of simpler concepts that express necessary and sufficient conditions for being innate. Similarly, according to the theory-theory—which maintains that concepts stand to one another in the same way that the terms of a scientific theory do—the identity of INNATE is partially determined by its relations to the other representations which comprise the theory of which it is a part (Laurence and Margolis, 1999).

If Griffiths' argument requires that constitutive aspects of INNATE confound I-properties, then different conceptions of concepts permit different views about what confounding might be. In the case of atomism, for instance, it would seem that confounding must crucially involve that portion of the world that the concept purports to represent. So, for example, perhaps INNATE confounds different I-properties in the sense that its extension contains many different kinds of entity (e.g., some that are present at birth, some that have evolved, some that have not been learned, and so on), though it (mis)represents them as sharing some unique common property, *innateness*.[7] In contrast, on the classical theory or theory-theory, confounding presumably involves some relation between INNATE and the concepts from which it is constituted.[8] Perhaps, for example, the representations that determine the identity of INNATE yield mutually inconsistent predications in much the same way as Aristotelian physics has been claimed to yield inconsistent predications about the speed of objects (Kuhn, 1977).

In view of the above, one might think that to determine what's wrong with Griffiths' argument, we must first decide which theory of concepts to adopt. But I do not plan to get embroiled in such matters. For our purposes, it suffices to know that whatever's doing the confounding must be constitutive of the concept. What I now propose to argue is that there are at least two relations between INNATE and

6. This will be a genuine possibility unless one accepts the sort of implausible concept (holism) that makes all beliefs constitutive of a concept's identity.

7. This is pretty much the view of confused concepts advocated by Millikan (2000).

8. Though there must be more to confounding I-properties than the mere claim that INNATE is a complex concept whose constituents pick out I-properties (e.g., EVOLVED, INBORN, PANCULTURAL, and so on. BACHELOR, we might suppose, has constituents that pick out the independent properties of *being unmarried* and *manhood*. But this is no reason to conclude that BACHELOR is confused. *Mutatis mutandis* for INNATE.

I-properties that need not be constitutive of the concept, and yet suffice to explain the close relation I-properties bear to innateness.

3.2 *Response 1: Evidential Versus Constituency Relations*

The first possibility is that I-properties are evidentially related to innateness claims. Roughly put, the occurrence of I-properties is not a (conceptually or metaphysically) necessary condition for something's being innate. Rather, it is merely that discovering a trait possesses one or more I-property provides *evidence* that the trait is innate.

Suppose that the relation between I-properties and innateness is an evidential one. Then it would be hard to sustain the charge of confusion on the grounds that INNATE confounds several independent properties. After all, having several independent lines of evidence for the application of a concept is both commonplace and unproblematic. So, if "confounding under a single term" involves things that are constitutive of the concept, then I-properties are not being confounded at all. The key point is, I hope, obvious: To sustain the Argument for Confusion, one needs to show that the relation to I-properties is not merely evidential.

3.3 *Response 2: Innateness as a Natural Kind*

A second response to the conceptual challenge turns on the suggestion that innateness may be a natural kind in much the same sense as viruses, metals, and species are sometimes alleged to be. If this is so, then we can make sense of the relationship between INNATE and I-properties in a way that evades the charge of confusion.

Though natural kinds have been characterized in a variety of different ways, a view that has gained considerable currency is that they are *homeostatic property clusters* (Boyd, 1991; Griffiths, 1997). Since it is both a view that Griffiths himself accepts and the most plausible I have encountered, I assume it in what follows. Roughly put, according to the homeostatic cluster view, a kind is natural if:

1. It is associated with a range of characteristics or symptoms which tend to be co-instantiated by instances of the kind, but are not genuine necessary conditions for membership.
2. There is some set of underlying causal mechanisms and constraints—a "causal essence," if you will—whose operation explains the co-instantiation of these various symptoms.
3. To the extent that there is any real definition of what it is for something to be a member of the kind, it is not symptoms but causal essence that defines membership.

By way of illustration, consider an illness such as influenza. Influenza is, on the homeostatic cluster view, a plausible candidate for natural kind status. First, it is associated with a range of characteristic symptoms—coughing, elevated body temperature, and so on—even though these symptoms do not define what it is to have flu. Second, there is a causal mechanism—roughly, the presence of the flu virus—whose operation explains the occurrence of the symptoms. Finally, to the extent that

influenza has a definition, it is the presence of the virus—or better, the presence of the virus producing some symptoms, but not the symptoms as such—that makes it the case that one has flu.

How does all this help address the conceptual challenge? Well, suppose that our concept of innateness picks out innate traits and that such traits constitute a natural kind. Then we should expect a cluster of symptoms—produced by the causal essence—typically to be possessed by innate traits. These properties would be empirically dissociable, and need not be necessary conditions for innateness. Even so, they will tend to be possessed by innate traits, just as having flu tends to be accompanied by various characteristic symptoms. The suggestion is that, for all the Argument for Confusion shows, I-properties may be related to innateness as symptoms are related to underlying causal essence. But notice: If this is so, then the charge of confusion will be hard to sustain. I-properties would not be confounded under a single term, any more than the term "influenza" confounds the properties of sneezing, elevated body temperature, and coughing. The key point: To sustain the argument against innateness, one needs to show that the relation I-properties bear to innateness is not merely that of symptoms to causal essence.

3.4 *Provisional Conclusions and Things to Come*

Let's take stock. According to the conceptual challenge, innateness is a confused concept because it confounds under a single term several dissociable properties. We have seen, however, that the argument is inconclusive. While it is correct to claim that there are many I-properties associated with innateness, this does not suffice to show that the concept is confused since there are relations I-properties might bear to innateness which are in no way indicative of confusion. In particular, they may be related either evidentially or in the manner that symptoms are related to an underlying causal essence.

Notice that these evidential and natural kind responses are not mutually exclusive. Indeed, one natural explanation of why the presence of I-properties is evidence for innateness is that I-properties are the symptoms of an underlying causal mechanism. But it's also important to see that the evidential response can be endorsed independently of the natural kind response since one might accept the idea that there are multiple sources of evidence for innateness even if one has avoided any commitment to natural kinds.

4 Making Sense of Innateness

The comments of the previous section were intended to blunt the conceptual challenge by showing that the Argument for Confusion is inconclusive. Yet an important challenge remains unaddressed. It's one thing to show that the argument leaves open various possibilities, and quite another to show that the possibilities can be satisfactorily exploited to provide a detailed account of the relationship between innateness and I-properties. In this section I take up this challenge. But in order to do so, I first need to say something about what innateness is; and this is not an easy task. Indeed, I suspect that part of what motivates the charge of confusion is that it has proven so hard to

provide an adequate explicit account of innateness. Though many different proposals are on offer, in what follows, I assume a view—sometimes called the psychological primitives view—that has been defended at length elsewhere by Fiona Cowie and myself (Cowie, 1999 Samuels 2002, 2004; see also Fodor, 1981). In section 4.1 I sketch this account of innateness; and in 4.2 I indicate some of its virtues. Finally, in section 4.3 I explain how, on the primitiveness view, I-properties are related to innateness.[9]

4.1 Innateness as Psychological Primitiveness

It is important to be clear what the primitiveness account was intended to be an account of. First, it was never intended to capture some folk notion of innateness. Indeed, the account is wholly consistent with the idea that the folk are entirely confused about such matters. Nor was primitivism intended to capture some notion of innateness that enjoys widespread application throughout the sciences. For one thing, it's doubtful that there is such a notion, since (as already noted) talk of innateness has fallen out of favor in many quarters of science.[10] Instead, primitivism takes as its focus just about the only area of science where innateness continues to play a substantial role: cognitive science and allied disciplines. Though not without its problems,[11] current research in cognitive science concerning innate structure seems reasonably productive and has generated some intriguing hypotheses that have been intensively explored in the light of empirical considerations. The aim of primitivism is to provide an account of innateness that makes sense of the roles that nativist theorizing plays in cognitive science and, moreover, explains why it really seems to matter to the contemporary study of cognition.

According to primitivism, the concept of innateness that figures in cognitive science marks a distinction between two broad classes of cognitive structure in terms of how they are acquired. Plausibly enough, every cognitive structure is acquired, at least in the *minimal* sense that there is some period of time when the organism possesses it, but some *prior* period when it does not. But some cognitive structures are acquired by *psychological* processes—by processes of perception or inference, for example—whereas others are not. According to primitivism, innate cognitive structures are the ones not acquired by psychological processes. Slightly more precisely, the claim is that a cognitive structure is innate (for an organism O) if and only if it satisfies two conditions:

> *Primitiveness Condition:* It is *psychologically primitive* in the sense that (a) it is posited by some correct psychological theory, but (b) no correct psychological explanation of its acquisition exists (not just in this historical moment, but in principle).
>
> *Normalcy Condition:* It is acquired by O in the normal course of development.

9. Please note that my central aim here is not to defend any particular account of innateness, but to develop a more detailed response to the conceptual challenge. Thus, I would be happy if there were alternative ways of explaining the relationship between innateness and I-properties. That said, the fact that it helps explain the relationship between I-properties and innateness is, I think, a reason to take the primitiveness view seriously.
10. The exception is immunology, where the term "innate" has a relatively clear and useful meaning.
11. See section 4 for discussion.

So, for example, the claim that Universal Grammar is innate in humans is tantamount to the claim that it is acquired during the course of normal development and that it is not acquired by a psychological process of any sort (e.g., perception, inductive learning, or conditioning).

Let's consider these conditions in a little more detail. According to the primitiveness condition, the acquisition of an innate trait cannot be explained by reference to any psychological process. This will include perceptual processes; but crucially, it will also include those processes ordinarily construed as kinds of learning—induction, abduction, deduction, statistical inference, conditioning, and so on—since these are among the paradigms of psychological processes.[12] Thus a psychologically primitive cognitive structure is, from the perspective of scientific psychological theorizing, one whose acquisition has no explanation. Presumably, its acquisition has *some* explanation (e.g., from neurobiology or molecular biology), but psychological theories cannot furnish us with such an account.

For the purposes of explaining how INNATE functions in cognitive science, the primitiveness condition is central. For what empiricists and other nonnativists invariably claim, and nativists deny, is that the acquisition of a given structure can be explained in terms of an inventory of psychological processes: perception, induction, deduction, conditioning, statistical learning, and so on (Segal, this volume). In contrast, the nativist maintains that some alternative, nonpsychological explanation will be required, one that is couched in the vocabulary of, for example, genetics, molecular biology, or neurobiology.

Nonetheless, the normalcy condition still has a role to play in understanding innateness as it figures in cognitive science. In particular, it is required to capture the fact that debates over the acquisition of cognitive structure occur against a background of assumptions about normal developmental conditions, and that the suspension of these conditions will cancel out the tendency to categorize psychologically primitive structures as innate. Consider, for example, such traits as acquired sociopathy or retrograde amnesia that result from accident, tumor, or other insults to the brain. Such traits are psychologically primitive since their emergence is not due to any psychological process but a consequence of damage to the neural regions that subserve cognition. Yet they clearly would not be categorized as innate. Here's where the normalcy condition comes in. For a cognitive trait to be innate, it needs to be the product of normal development. Yet it is not plausible to claim that cognitive traits resulting from neural insult are products of normal development. On the contrary, they appear to be prototypically abnormal. Thus such cases, though psychologically primitive, are not innate.

One complaint that has been leveled against primitivism is that this normalcy condition is unduly vague (Mameli and Bateson, 2006). There is something to this. Clearly,

12. This list of processes is not, of course, intended to be exhaustive, since there may well be psychological explanations that appeal to acquisition processes which are less familiar, or indeed ones that we currently know nothing about. So, for example, there may be various specialized knowledge acquisition mechanisms that do not readily fall within the familiar taxonomy of learning processes. Similarly, there may be processes for the acquisition of noninnate desires—a topic that little is currently known about—which, though psychological, are not readily reducible to such processes as induction, deduction, abduction, and so on.

there are many possible notions of normalcy that might be invoked here. But one should be careful not to overplay the point. Though it would no doubt be desirable to provide a more precise account of normalcy, I'm inclined to think that the task is no more pressing here than it is in many other areas of science. My reason for saying this is that all sciences—with the possible exception of physics—typically assume some largely unarticulated set of normal conditions in formulating their laws and generalizations. In the jargon of philosophy, they are *ceteris paribus generalizations* that apply only when all else is equal (Carroll, 2003). The suggestion is that much the same is true of innateness hypotheses in developmental psychology and other areas of cognitive science. In effect, they are generalizations that, like virtually all other scientific generalizations, tacitly assume some set of background normal conditions. So, for example, the claim that humans possess an innate object concept is tantamount to the claim that, *ceteris paribus* (i.e., given standard background conditions), humans acquire the object concept via some nonpsychological process. On this view, then, notions of normalcy are no more important to understanding innateness hypotheses in cognitive science than they are to understanding hypotheses in geology, economics, or, for that matter, aerodynamics.

4.2 *Some Virtues of Primitivism*

Why take the primitiveness account seriously? There's a long story here that's beyond the scope of the present chapter. (For more details, see Samuels, 2002.) But for the moment, let me mention a few relevant considerations. First, primitivism handles a wide range of difficulties that plague other accounts. To take only one example, some accounts of innateness imply that the environment makes no contribution to the acquisition of innate traits. This is implied, for example, by the claim that innate traits are "the product of interactions internal to the organism" (Elman et al., 1996, p. 23), and by the familiar view that innate traits are caused by genetic factors alone (Block, 1981). The problem with such views is that they render all innateness claims *obviously* false, since it is little more than a banal truism—sometimes labeled the Interactionist Thesis—that human traits depend for their development on both internal and external factors. A fetus does not develop arms and legs, for example, without exchanging oxygen, water, and nutrients with its mother; and a neonate does not develop teeth and hair without breathing, drinking, and eating: all of which involve interaction with an environment external to the organism. Primitivism avoids such problems because it is wholly consistent with the Interactionist Thesis. For though it implies that innate traits are not the product of certain sorts of environmental interaction (viz., psychologically mediated ones), it in no way precludes the sorts of nonpsychological environmental effects mentioned above.

A second reason to take primitivism seriously is that it helps make sense of many aspects of the innateness debate in cognitive science. For instance, and in contrast to some other proposals, it explains why the central arguments that figure in the debate are relevant to establishing (or rejecting) innateness hypotheses. Poverty of the stimulus arguments turn out to be relevant, for example, because it is very natural to interpret them as attempting to show that certain kinds of structures (e.g., specialized linguistic knowledge) are not acquired by learning or some other psychological processes (Segal, this volume).

A third and, I think, very important reason for taking primitivism seriously is that it helps explain the peculiar significance of innateness hypotheses to cognitive science. As mentioned earlier, many areas of biology have dispensed with the notion of innateness altogether—in large measure because it plays no useful theoretical role (Johnson, 1997). Why, then, should it continue to have a foothold in the cognitive sciences? One possibility is that this is an unfortunate oversight that should be remedied immediately (Griffiths, 2002). But if the present proposal is correct, then the notion of innateness in fact functions to frame two issues of genuine importance to psychology and cognitive science. First, it delimits the scope of psychological explanation: Once we know that a given structure is innate, we also know that our scientific psychology should not—indeed, cannot—be expected to explain how it was acquired, and that we must instead look to biology or some other science for an explanation. Second, discovering which structures are innate also furnishes us with the resources—the "building blocks"—from which to construct developmental psychological theories. Such theories must, on pain of regress, presuppose the existence of structures whose acquisition is not explained by psychology. So, if we know that a given structure is innate, then it can be invoked by psychological theories to explain the development of other psychological traits.

A final reason to take primitivism seriously is that it does a good job of explaining the connection between innateness and the various I-properties discussed earlier. It is to this topic that I now turn.

4.3 *The Status of I-Properties*

So we are finally in a position to consider the relation between innateness and I-properties. The point I seek to make is that while I-properties are seldom either necessary or sufficient for innateness, they are evidentially related. The claim is not that possessing a single I-property is always—or even typically—strong evidence for innateness. On the contrary, it is typically the case that only the presence of multiple I-properties provides *strong* support. What I argue is that, for each I-property, the discovery that a cognitive structure possesses that property almost invariably adds evidential support to the claim that it's innate.

4.3.1 Being Unlearned. Let's start with the connection between innateness and learning. Being unlearned may be necessary for innateness. At any rate, I know of no case in cognitive science where the fact that a structure is learned is not taken as overwhelming evidence that it is not innate. But being unlearned is clearly not sufficient for innateness. A psychological structure that resulted from an environmentally induced brain lesion, for example, would not be learned, but it would not be innate either.

Nonetheless, it should be clear that being unlearned is evidence for innateness. Though there are considerable problems with how to understand what learning is, it's abundantly clear that, however we characterize learning, it had better turn out to be a *psychological* process. This claim is, as far as I can tell, universally accepted among cognitive scientists. Indeed, all the paradigms of learning processes—induction, abduction, conditioning, observation learning, and so on—are also paradigmatic psychological

processes. But if this is so, then learned cognitive structures won't be psychologically primitive, and hence won't be innate. Moreover, evidence that a psychological structure is unlearned will count as strong *abductive* evidence that it's innate, since the fact that it is not acquired via learning will be strong evidence that it's psychologically primitive.

4.3.2 *Presence at Birth.* Presence at birth is neither necessary nor sufficient for innateness. First, it is not sufficient because prenatal learning is possible (Gottlieb, 1997). In which case, the paradigmatic example of traits that are not innate (i.e., learned traits) can be present at birth.

Nor is presence at birth necessary for innateness since, as Descartes observed almost four centuries ago, innate characteristics can be acquired quite late in development. This point is commonly made by analogy with nonpsychological traits—such as pubic hair and other secondary sexual characteristics—which are plausibly innate but clearly not present at birth. According to nativists, what goes for morphological structures is true of psychological ones as well. Alan Leslie and his collaborators have maintained, for example, that the innateness of a theory of mind mechanism is wholly consistent with the thesis that it develops postnatally (Scholl and Leslie, 1999). Similarly, concept nativists frequently endorse the view that innate concepts can be the product of postnatal maturation (Fodor, 1981).

So, it's implausible to claim that presence at birth is either necessary or sufficient for innateness. Nevertheless, it is still evidence for innateness. As anyone with even a fleeting familiarity with recent developmental psychology will be aware, it is common to argue that certain cognitive structures—number concepts or knowledge of physical objects, for example—are probably innate, on the grounds that infants possess them at, or shortly after, birth. Such *arguments from early development* figure prominently, for example, in the work of Spelke, Carey, and Wynn (Wynn, 1992b; Carey and Spelke, 1994; Lipton and Spelke, 2003). As Marcus and others have noted, what matters for such arguments is not early acquisition *as such*, but the heavy constraints that early onset imposes on theories of cognitive development (Marcus, 2001). Specifically, where acquisition is extremely early (e.g., at birth), it will often be the case that the cognitive structure is not plausibly acquired via the sorts of learning processes we know anything about: classical conditioning, induction, abduction, and so on. But since such learning processes are *the* paradigm examples of psychological acquisition processes, arguments from early development provide support—albeit nondemonstrative—for the claim that some structures are psychologically primitive, and hence innate. Presence at birth is thus very often good evidence for innateness even if it is neither necessary nor sufficient.

4.3.3 *Insensitivity to "Extrinsic" Factors in Development.* Insensitivity to extrinsic environmental factors is also neither necessary nor sufficient for innateness, yet it constitutes good evidence. One reason environmental insensitivity is unnecessary for innateness is that innate structures can be *triggered*—roughly, acquired via nonpsychological, "brute-causal" processes (Fodor, 1981). To be sure, the notion of triggering is far from transparent. But what's clear is that triggering results in acquisition only where the relevant environmental factors obtain. Thus, innate structures that depend on triggering are not invariant with respect to environmental factors.

Nor does environmental insensitivity seem sufficient for innateness. So, for example, it seems possible to infer a belief from innate beliefs. But under such circumstances, the inferred belief would not normally be treated as innate since it was acquired by a psychological process (e.g., deductive inference). Even so, the process responsible for the acquisition of the belief could be insensitive to environmental factors.

Nevertheless, insensitivity to environmental factors can constitute good evidence for innateness. First, invariance with respect to environmental factors is evidence that a cognitive structure is a product of normal development. For what it indicates is that the structure will emerge across a wide range of contexts. Second, invariance with respect to environmental variation is also evidence that the trait in question is psychologically primitive. The reason is that, as Godfrey-Smith (1996) notes, psychological processes tend to be highly sensitive to variation in local environmental factors. Think of the states produced by perceptual processes, such as vision, or the outputs of inductive learning, or the consequences of operant conditioning. In all these cases, the products of psychological processes are highly sensitive to local environmental factors. Thus, evidence that the development of a structure is *not* sensitive to environmental variation is evidence that it is not learned and, hence, evidence that it's psychologically primitive.

4.3.4 Monomorphism. Another I-property that is neither necessary nor sufficient for innateness is monomophism. Roughly put, a trait is monomorphic if it takes only one form among a population. So, for example, the inability to synthesize vitamin C is monomorphic in humans, whereas eye color is polymorphic since there is variation with respect to that trait.

Although cognitive scientists are often interested in monomorphic psychological traits—the ability to use language or to perceive, for example—it is possible for a structure to be innate but polymorphic. The literatures on, for example, (putative) innate individual differences and sex differences are testament to this possibility (Kimura, 1999). But if this is so, then being monomorphic is not necessary for innateness. Nor is monomorphism sufficient for innateness. Suppose, for example, that Piaget was correct in claiming that all normal children acquire the concept of an object via an extended period of learning. Such a trait would be monomorphic but would not be innate since, by assumption, it was learned.

Even so, monomorphism can still be evidence of innateness. First, it is clearly evidence of normal development. If a trait develops in *all* normal humans, then presumably it occurs in the course of normal human development. Second, monomorphism can also be evidence for psychological primitiveness. The fact that a trait is monomorphic typically raises the probability that its development is relatively insensitive to local environmental variation. But as noted earlier, psychological acquisition processes tend to be highly *sensitive* to environmental variation. Thus the monomorphism of a psychological trait can be evidence that it was not acquired via a psychological process and, hence, that it is primitive.

One needs to be careful not to overplay this point. After all, it is not that psychological processes *cannot* produce monomorphic traits, or that nonpsychological processes are *always* insensitive to local environmental conditions. Rather, the point is that psychological processes *tend* to produce variable outcomes as a function of environmental

variation. Thus, evidence that a psychological trait is monomorphic raises the probability that a psychological process is not responsible for its acquisition.

4.3.5 *Pancultural.* Being pancultural is also neither necessary nor sufficient for innateness. Prevalence in all cultures is unnecessary since it is possible for the isolation of reproductive populations to result in members of one culture possessing innate traits not possessed in others. Whether this possibility is ever in fact realized is another issue. But what matters here is merely that it's a genuine possibility. Nor is being pancultural sufficient for innateness, since there are other explanations of pancultural prevalence which depend on learning. Most notably, appropriate patterns of cultural transmission can in principle produce pancultural traits.

Nonetheless, the pancultural prevalence of a cognitive structure can count as *evidence* for innateness. Indeed (and unsurprisingly), the kind of evidence provided is similar to that provided by monomorphism. First, the fact that a trait is found in all cultures is *prima facie* evidence that it's a product of normal development. Second, given plausible assumptions, the pancultural prevalence of a trait raises the probability that the processes responsible for acquisition are relatively insensitive to local environmental variation. In which case, it raises the probability that it wasn't acquired by a psychological process since, as already noted, psychological processes tend to be highly sensitive to such variation.

4.3.6 *Having an (Adaptive) Evolutionary Explanation.* Finally, having an evolutionary explanation—adaptive or otherwise—is neither necessary nor sufficient for innateness. First, the failure of necessity. Though it's very implausible to claim—as, for example, Descartes did—that God, not evolution, endowed us with innate knowledge, such a position is perfectly consistent.[13] But if this is so, then having an evolutionary explanation is not a necessary condition for innateness.[14]

Nor is having an (adaptive) evolutionary explanation sufficient for innateness. For, as developmental systems theorists are fond of pointing out, the fact that a trait is a product of evolution is wholly consistent with a wide range of ontogenetic proposals (Griffiths, 1997; Oyama, 2000a). Specifically, since "nature selects for outcomes," it is possible for the ontogeny of selected traits to depend heavily on learning (Lehrman,1970; Griffiths and Gray, 1994). Consider an example discussed at length by Mameli and Bateson (2006): fish-catching in the osprey eagle. This trait plausibly evolved as a consequence of natural selection. Yet the ability of any individual bird to successfully snatch healthy fish from the water's surface is not innate, since it results from a protracted period of learning. In which case, having an evolutionary explanation is insufficient for innateness.

13. More realistically, it seems possible for cognitive *deficits* to lack an evolutionary explanation and yet be innately specified. Autism may be an example.

14. Even less plausible is the claim that having an *adaptive* evolutionary explanation is necessary for innateness. In some of his moods, for example, Chomsky appears to claim that we possess an innate language faculty that was not produced by natural selection (Chomsky, 2000). In doing so, he may be guilty of upholding an implausible view; but the problem is not that his position is inconsistent.

Nevertheless, there are familiar reasons to suppose that the presence (or absence) of an adaptive explanation is evidentially related to the innateness of psychological structure. The psychological structures of central interest to cognitive science—especially in debate over innateness—are almost invariably complex *functional* traits: faculties, mechanisms, concepts, items of knowledge, and so on. But what sorts of explanation can account for our possession of such traits? As often noted, there are two main alternatives: (a) learning theoretic accounts and (b) adaptive evolutionary explanations (Pinker and Bloom, 1990). But if a structure is innate, then the first option is unavailable. Thus, for complex functional psychological traits, it is very plausible to suppose that if they are innate, they are products of natural selection.

Notice: If the above is correct, then adaptive explanation is evidentially related to innateness hypotheses in at least two respects. First, evidence that a complex, functional psychological trait does not have an adaptive explanation is typically strong evidence *against* its being innate. For if it's not selected, then it's hard to see how the trait's functionality can be explained without invoking learning processes. So, evidence against selection is typically evidence against innateness as well.

Second, though the degree of support is weaker, evidence that a complex, functional psychological trait has an adaptive explanation also provides support for the claim that it's innate. Clearly, not all complex functional psychological traits are naturally selected. On the contrary, it's plausible that a huge number of such traits are not adaptations and yet are acquired either by individual learning or by cultural transmission. But if this is so, then discovering that a trait has an adaptive explanation raises the probability that the trait is innate, since (a) we already have reason to suppose that innate functional psychological traits are naturally selected, and (b) the discovery that the trait is an adaptation eliminates the possibility that it is among the many nonselected, learned traits.

We should be careful not to overplay the strength of this inference since, as already noted, it is possible for a trait to be selected but not innate. Nonetheless, by raising the probability that the trait is innate, the present consideration adds evidential weight to innateness hypotheses; and when it is combined with other considerations, it can help provide a strong case for innateness.

5 Confusion Without Confused Concepts

The main burden of this chapter has been to argue that cognitive science's concept of innateness is not confused. But a puzzle remains. If INNATE is not confused, why do *debates* about innateness in cognitive science sometimes appear so confused? I want to close with a few remarks on this issue.

5.1 *Three Marks of Confusion*

There are at least three features of innateness debates that one might think indicate confusion:

1. **Cross talk.** It is not uncommon for the claims of one theorist or research group to be systematically misconstrued by others. To take one example:

Nonnativists sometimes appear to construe their opponents as committed to the existence of *preformed* cognitive structures, even though no contemporary nativist would defend such a position (Piaget, 1980; H. D. Smith, 1999; see also Spelke, 1998).

2. **Fallacious argumentation.** Debate is often punctuated by implausible—even irrelevant—objections and arguments. We have already mentioned some examples of infelicitous inferences that nativists have committed. But nonnativists are at least as guilty. So, for example, it is sometimes claimed that a trait is not innate on the grounds that it undergoes postnatal development, even though such development is wholly consistent with its being innate (Karmiloff-Smith, 1998).
3. **Failure of convergence.** Despite decades of research—and the body of mutually accessible data and argument it has produced—there has been little convergence of opinion about the innate structure of the human mind. This might be thought to indicate a confusion of sorts. For surely, if innateness hypotheses—and the debates in which they figure—are not confused, we would expect such endeavor to yield fairly widespread consensus.[15]

Advocates of the conceptual challenge can claim that the confused nature of the innateness concept is largely responsible for these features. But how should this be explained if one rejects the charge of conceptual confusion?

5.2 *Shallow Explanatory Factors*

I suspect that many factors are responsible for the marks of confusion. Some are no doubt quite general, and affect much intellectual inquiry. Cognitive scientists are not, for example, the only researchers to make bad arguments or to defend implausible "pet" theories for extracognitive reasons. But such general considerations alone fail to account for the apparent fact that debate over innateness is more confused than many other scientific disputes. To explain this, we require more specific considerations.

And there are lots, though many seem explanatorily shallow. It may be, for example, that long-standing associations between nature-nurture issues and various political-cum-moral concerns invest research into our innate endowment with a degree of emotional and moral significance that is apt to cloud judgment and produce heated, unhelpful exchanges. This is in evidence, for example, from debate surrounding evolutionary psychology, where nativist hypotheses are challenged not merely on scientific grounds, but on moral ones as well (Pinker, 2002; Rose and Rose, 2000).

Another specific consideration that may go some way toward explaining the above marks of confusion is the ambiguity of the term "innate." First, if the term

15. Hume expressed much the same point when noting that those incautious enough to use the notion of innateness are apt to "draw out their disputes to a tedious length, without ever touching the point in question" (Hume, 1983).

"innate" is ambiguous, it would be unsurprising that theorists sometimes talk past each other. Second, such misunderstandings may be amplified over time so as to produce bad objections that miss their target. Third, where individual researchers fail to keep track of distinct senses of "innate," their arguments may end up trading on equivocations. Finally, the ambiguity of "innate" might also help explain the apparent failure of any consensus to emerge. No doubt cross talk and poor argument are genuine blocks to intellectual progress. But it may also be that much apparent lack of consensus is merely apparent. Rather than genuinely disagreeing on substantive points, ambiguity may result in merely verbal disagreement.

So, there are relatively specific, though superficial, considerations that may help explain the confusions that punctuate debate over innateness. Yet it's hard to believe this is the whole story. To be sure, heated moral exchange is unlikely to make for clear-headed science. But, while such controversies exist, they are typically quite distant from the central concerns of most scientists studying our innate endowment.[16] Moreover, it's hard to see how mere ambiguity could explain the degree of confusion that appears to occur. Most cognitive scientists are aware that "innate" has been used to mean different things. In which case, why aren't they able to eliminate the undesirable effects of ambiguity by keeping track of how the word is being used in different contexts? This might be an inconvenience; but it's hard to believe that cognitive scientists are too feeble to perform such an apparently undemanding task. Surely some additional, deeper explanation—one that explains this inability—would be desirable.

5.3 *The Disruptive Influence of Folk Theory*

One intriguing proposal suggested by Griffiths is that our commonsense beliefs interfere with efforts to theorize about cognitive development (Griffiths, 2002). Specifically, he maintains that our commonsense concept of innateness is an expression of *folk biology*—roughly, a pancultural, intuitive theory we use in a largely unreflective and automatic manner when thinking about biological kinds (Keil, 1989). Though cognitive scientists disagree about the details of our folk biology, one widespread view is that it is *essentialist* in character, in that it ascribes to each organism an unobservable, inner *essence*, shared by all members of the species, which determines species membership and produces a range of fixed, species-typical characteristics (Medin, 1989). Griffiths suggests that when it is applied to our own species, this notion of essence is a near synonym "for human nature," which in turn is a near synonym for "innate features of human beings" (Griffiths, 2002). Thus, he maintains that judgments about innateness are heavily influenced by our folk biology and, indeed, are tantamount to claims about which traits are produced by our species essence.

16. Anecdotal though striking: In the three years of regular workshops and conferences that made up the AHRB project of which this volume is a part, only one talk discussed to any significant degree the (putative) moral implications of nativism. Moreover, I seldom heard such matters discussed by conference attendees outside of formal sessions.

If the above proposal is correct, it's not hard to see how it might provide the resources to explain crucial respects in which debate over innateness is confused. First, given that we are all disposed to apply our folk biology in an unreflective, largely automatic manner, it would be unsurprising if essentialist commitments were to infect our efforts at theorizing scientifically, leading us to make infelicitous assumptions and inferences even though we may not be inclined to accept them in our more reflective moments.[17] Moreover, the influence of folk biology might help explain why it has proven so hard to disambiguate and keep track of different uses of the term "innate." As Griffiths points out, on the present story, folk biology will act as a "sink that draws other, more refined, conceptions back towards it, leading us to collapse important distinctions and elide distinct uses of the term 'innate'" (Griffiths, 2002).

So, if folk biological essentialism exerts a powerful influence on our thought about innateness, then it would help account for some of the features mentioned earlier. But we should be cautious not to conclude, as Griffiths does, that this supports the conclusion that no concept of innateness should figure in scientific inquiry. First, contrary to what Griffiths appears to suggest, it's not plausible that the folk concept of innateness *is just* the notion of an essence applied to human beings. Among other things, the two cannot be identical, since our folk notion of innateness permits talk of innate *differences*—in eye color and intelligence, for example—as well are innate commonalities. Moreover, on the present proposal, it is hard to see why the innateness concept should be any more problematic than the concept of species, since both are parasitic, in much the same way, on the folk biological notion of an essence. To be sure, the concept of species has had its problems. But as Griffiths himself notes, "The scientific concept of species emerged smoothly from the prescientific practice of categorizing organisms into folk species" (Griffiths, 2002). If a scientific species concept could emerge from our folk biology, then why couldn't a scientifically respectable notion of innateness?

5.4 *INNATE as a "Framework Concept"*

Let me mention one final potential source of confusion in debate over innateness: the concept of innateness itself. My suggestion is not, of course, that the concept is confused. Rather, the suggestion is that if primitivism is correct, we should predict certain marks of confusion. According to primitivism, there is a very intimate connection between our applications of INNATE and what conception of scientific psychological explanation—what theoretical framework—we adopt for the purposes of doing cognitive science. If you're a classical computationalist, for example, then the sorts of claims you make about innate structure may be quite different from those made if you're a connectionist. This is because different kinds of psychological

17. I doubt that this is the only example of such a problem. Another example concerns the notion of mind. Though very few scientists explicitly accept a dualist conception of mind, it is remarkably common for scientists to treat mental and physical as mutually exclusive categories.

theory presuppose different sorts of psychologica primitive and, moreover, have different resources with which to explain the acquisition of psychological structure.[18] For this reason we might call INNATE a "*framework concept*."

How might this help explain the confused character of debate over innateness? Let me mention two contributions. First, it helps explain some of the cross talk that infects debate over innateness. Specifically, where disputants fail to realize that their disagreements about innateness turn on differences of opinion about the nature of psychological explanation, we should expect debates to involve a great deal of cross talk: one party claiming that a given structure's acquisition cannot be explained (relative to one framework), the other claiming that it can be (relative to another).

Second, primitivism also helps explain the failure of convergence in debates over innateness. The problem is that in order to resolve such debates, we need to address issues about what the form of scientific psychological explanations ought to be—what kinds of processes and structures a mature scientific psychology ought to posit. But in order to resolve this debate, we also need to have some reasonably clear idea of what basic cognitive structures there are—what basic elements can be invoked in the construction of psychological theories, but whose acquisition, psychology need not explain. And this amounts to saying that we need to know what (kinds of) *psychologically primitive* structures there are—what structures are innate. Now, I don't want to suggest that this means there's some kind of vicious explanatory circularity at the heart of cognitive science. After all, there are plenty of instances in science where answers to different questions undergo mutual adjustment, in the light of further discoveries, such that they cohere. But it does mean that two of the hardest questions in cognitive science—"What innate structures are there?" and "What kinds of theories of cognition ought we to develop?"—need to be addressed in tandem. No doubt this is not good news for cognitive scientists who have tended to characterize the two issues as if they were more or less independent. The need to address them together may well make addressing either problem all the more difficult.

18. Notice that if this is so, we should expect debates over innateness to frequently devolve into disputes over the nature of scientific psychological explanation. This prediction appears to be confirmed. The debate between early cognitivists, such as Chomsky, and behaviorists, such as Skinner, is a case in point; and so is the more recent debate between connectionists and classicists in cognitive science. In both cases, debate between nativists and their opponents rapidly turns into a dispute over the relative merits of different accounts of psychological processes. See Samuels (2002) for more detailed discussion.