

WHAT IS INNATENESS?

What is innateness?

In molecular developmental biology innateness seems as antiquated a theoretical construct as instinct and equally peripheral to any actual account of gene regulation or morphogenesis. In behavioral ecology, some authors regard the innateness concept as irretrievably confused and the term 'innate' as one that all serious scientific workers should eschew (Bateson, 1991; Bateson & Martin, 1999) whilst others claim that the popular demand to know if something is "in our genes" is best construed as a question about whether a trait is an adaptation (Symons, 1992: 141). In cognitive psychology, however, whether a trait is innate is still regarded as a significant question and is often the subject of heated debate (Cowie, 1999). In an attempt to clarify what is at issue in these debates, philosophers have proposed numerous analyses of the concept of innateness. Some years ago, Stephen Stich defined innateness as the disposition to appear in the normal course of development, that is, to be part of the typical or normal phenotype of that kind of organism (Stich, 1975). More recently, André Ariew has analyzed innateness in terms of developmental canalization, a phenomena which he uses to clarify the intuitive idea that the innate traits are insensitive to variation in the developmental environment (Ariew, 1996; Ariew, 1999). William Wimsatt has explicated innateness using his concept of 'generative entrenchment': innate traits are those upon which many other features of the organism are built and whose presence is therefore essential for normal development (Wimsatt, 1986, 1999). In this issue, James MacLaurin argues that a trait is innate if "there exists within the population some mechanism or process that maintains the developmental resources which very reliably produce the trait in question" (MacLaurin 2002, 126). Fiona Cowie and Richard Samuels have both offered methodological analyses of innateness (Cowie, 1999; Samuels, in press). Samuels argues that innate traits are 'psychological

primitives'—traits that are mentioned in psychological explanations but which are not amenable to the explanatory strategies that define psychology as a scientific domain. Psychology appeals to innate traits in its explanations, but the explanation of the innate traits themselves lies outside psychology. Cowie identifies a number of different roles that the innateness concept has played in particular episodes in the history of philosophy and psychology, one of which resembles that described by Samuels. In my view, each of these proposals correctly identifies a belief or an intellectual strategy that lies behind the use of the term 'innate' in certain specific research contexts. None of them, however, is an adequate account of the concept of innateness.

In an earlier work I have argued, following a number of developmental psychologists and behavioral ecologists,¹ that the concept of innateness conflates a number of independent biological properties and is thus a confusing and unhelpful notion with which to understand behavioral or cognitive development (Griffiths, 1997). Three broad ideas are bundled together in the innateness concept:

- Developmental fixity
- Species nature
- Intended outcome

For reasons that will become clear below, all three terms refer to clusters of related ideas and show up in different forms in different historical, cultural and intellectual contexts. 'Developmental fixity' means that the trait is in some sense 'hard to change': it is insensitive to environmental inputs in development; its development is or appears goal-directed, so that when prevented from developing in one way it develops in another; changing it disrupts or impairs development. 'Species nature' means that innate traits reflect what it is to be an organism *of that kind*, with consequent associations of typicality or universality. 'Intended outcome' means that innate traits are how the organism is *meant* to develop: to lack them is to be malformed; upbringings that disrupt them are simply 'bad rearing', as Konrad Lorenz used to say. This intentional or normative element of the innateness concept is today usually assimilated to the idea of design by natural selection: innate traits are those that

the organism is *designed* to possess or which are *programmed* in its genes. In my earlier work I identified scientific descendants of these three clusters of ideas, namely, being insensitive to environmental factors in development, being universal in the species (I now prefer the vaguer phrase 'species-typical') and being the product of adaptive evolution. I argued that because these three are empirically disassociated, a theoretical construct that conflates them is undesirable. In particular, such a construct will give rise to illicit inferences from the presence of one biological property to the presence of the others.

In this paper I want to simultaneously defend my earlier view and offer a deeper diagnosis of the problem. The innateness concept is an expression of 'folk essentialism'—a distinctive feature of pre-scientific thought about animate things ('folkbiology'). Folk essentialism understands biological species as the manifestation of underlying 'natures' shared by all members of a species. The three aspects of the innateness concept that I identified are all elements of folk essentialism. Since folk essentialism is both false and fundamentally inconsistent with the Darwinian view of species, it should be rejected. However, folk essentialism is at the very least a widespread human cognitive trait, probably pancultural, and quite possibly a canalized outcome of cognitive development. Because 'innate' is a common term whose vernacular meaning embodies this way of thinking about living systems, attempts to stipulate a new, restricted meaning for this word are unlikely to be successful. In any case, proposals for linguistic form should be formulated with the intention of promoting a more accurate understanding of living systems, not preserving intuitions that reflect folkbiology. The several proposed explications listed above each describe a genuine biological property and several others are needed to adequately describe all the phenomena that innateness has been invoked to explain. Therefore, I suggest, the use of new, neutral terms for each of these several properties is preferable to trying to retain the term 'innate' for one or more of them.

Innateness in behavioral science

Patrick Bateson lists seven different senses in which the term 'innate' has been used in animal behavior studies (Bateson, 1991: 21):

- Present at birth
- A behavioral difference caused by a genetic difference
- Adapted over the course of evolution
- Unchanging through development
- Shared by all members of the species
- Not learned
- A distinctly organized system of behavior driven from within²

To this list we can add an eighth sense, that of being something that can be taken as given with respect to the set of causal factors currently under investigation. This sense is particularly prevalent in psychology, where 'innate' traits are those that are to be explained biologically rather than psychologically (Samuels, in press). Bateson's sixth sense, in which the innate traits are simply the complement of the learnt traits, is perhaps an instance of this eighth sense, reflecting the domination of psychology by learning theory in the period when ethology was reviving the concept of an innate trait (see e.g., Tinbergen, 1957). The use of innateness in this last sense as a way to block a demand for explanation can make ascriptions of innateness the subject of considerable controversy, especially when scientists disagree about explanatory priorities or disciplinary boundaries. This is one reason why the reintroduction of the innateness concept to animal behavior studies by Konrad Lorenz and other early ethologists (Schiller, 1957) provoked immediate hostility from developmental psychobiologists (Johnston, 2001; Lehrman, 1953). Developmental scientists rejected the innateness concept for the same reason they had rejected the instinct concept earlier in the century—these concepts are used to signal that the traits in question can be treated as given and developmental scientists are engaged in elucidating their origins!

However, the disagreement between Lorenz and his critics was not merely a clash between competing explanatory interests and disciplinary orientations. Developmentally oriented scientists argued that ethologists were using the innateness concept to make invalid inferences via fallacies of ambiguity. The properties of developmental fixity, universality and

evolutionary origin were freely inferred from one another when developmentalists knew them to be empirically disassociated. The traditional notion of universality itself conflates the two very different properties of being *monomorphic* and being *pancultural*. A trait is monomorphic if only one form of that trait is found in a species—the inability to synthesise vitamin C and the elevation of the heart rate in fear are monomorphic human traits. In contrast, a trait is pancultural if it is found in all cultures. Many pan-cultural traits, such as hair color and susceptibility to early-onset diabetes, are *polymorphic*: more than one form of the trait exists in the same species. Neither being monomorphic nor being pancultural has any very strong connection to being the result of adaptive evolution. Evolution is as capable of producing polymorphisms as monomorphisms and some non-adaptive evolutionary mechanisms, such as developmental constraint, are likely to produce monomorphic traits. All healthy human beings have the same arrangement of bones in their limbs, an arrangement they share with the whole vast group of tetrapods, but the very ubiquity of this arrangement is strong evidence that humans do not have it because of its adaptive value. Nor need evolved traits be pancultural, as evolutionary psychologists are fond of pointing out. Different cultural environments can systematically induce different developmental outcomes (Tooby & Cosmides, 1992). In this respect different cultures can resemble the different ecological zones that induce the same species of plant to develop into different ecomorphs, for example, a low-growing shrub at high altitudes and an upright tree at lower altitudes.

The relationship between having an evolutionary explanation and exhibiting developmental fixity is equally problematic. There is no intrinsic tendency for evolved traits to be buffered against variation in environmental inputs to development. Developmental psychobiologists since Lehrman have documented innumerable cases in which evolved developmental outcomes require a rich and highly specific developmental environment. In rhesus macaques, for example, the recognition of emotional expressions in conspecifics and the ability to cooperate in agonistic interaction depend on infant social interaction for their development (Mason, 1985). These findings throw no doubt whatever on the claim that these abilities in adult macaques are the result of adaptive evolution. The constructive role of environmental factors in the development of evolved traits should come as no surprise. Selection cannot favour a trait that compensates for the loss of a developmental input that is, as a matter of fact, reliably

available. Evolution does not anticipate future contingencies. In fact, such alternative developmental pathways will be dismantled by mutation if a developmental input becomes readily available, as happened in the primate lineage with the pathway used by most other mammals to synthesize their own vitamin C (Jukes & King, 1975).

Finally, as developmental scientists have reiterated ever since Lehrman, universality and developmental fixity cannot be equated. Ariew uses this point to argue against Stich's earlier analysis of the innateness concept: the fact that a trait is invariant across normal environments leaves it entirely open whether this is because the trait is insensitive to environmental factors or because the causally relevant factors are invariant across normal environments (Ariew, 1999: 134). In this argument, of course, Ariew is using intuitions driven by one element of the innateness concept (developmental fixity) to argue against an explication that focuses on another (universality/species typicality). Ariew's argument is correct, but Stich could equally well reply by using intuitions about species-typicality to argue against Ariew's explication in terms of developmental fixity. The fundamental physiological and mental traits that depend on environmental vitamin C for their development, for example, are intuitively innate.

In the light of the developmental critique of the innateness concept, some ethologists rejected it entirely, as can be seen in Bateson's work (1983, 1991) and in that of Robert A. Hinde (1968). Others used the notion of a genetic program to allow them to ignore development in the context of studying evolution while admitting that evolved phenotypic traits are contingent upon a host of other factors in development. Konrad Lorenz took this route in his later work, denying that phenotypic traits could be meaningfully described as innate and asserting instead that: "certain parts of the information which underlie the adaptedness of the whole, and which can be ascertained by the deprivation experiment, are innate." (Lorenz, 1965: 40.). Something like this approach has become orthodox in contemporary behavioral ecology although it is now more usual to say directly that a trait is programmed in the genes than to make a detour through the concept of innateness.³

Folkbiology and folk essentialism

The term 'folkbiology' refers both to pre-scientific thought about the animate realm and to the field that studies such thought (Medin & Atran, 1999). Research in folkbiology is conducted by cognitive anthropologists

who set out to describe and explain patterns of reasoning about the living world in various human cultures and by cognitive psychologists who study the emergence of these patterns of reasoning in children and their manifestation in adults under controlled conditions. Folkbiological research in cognitive anthropology has revealed some apparently pancultural features of human thought about the animate realm (Atran, 1990, 1999; Berlin, 1992, 1999; Coley, Medin, Proffitt, Lynch, and Atran, 1999). Although classifications of living things are culturally specific, the form of these classifications is the same everywhere. Organisms are classified hierarchically, with five distinctive taxonomic levels: folk kingdom (e.g., plant, animal); life form (e.g., tree, mammal); generic species (e.g., oak, dog); folk specific (e.g., white oak, poodle); folk varietal (e.g., spotted white oak, toy poodle). This hierarchical taxonomy is used in inductive inference: the degree of confidence with which observed properties of one organism are projected to another organism is predicted by their taxonomic distance from one another in the local scheme of classification. Categories at the generic-species level are inductively privileged: higher-level categories support fewer and weaker inductive inferences while lower-level categories add little to the strength or number of inferences. Generic species are thus the level at which folk biological reasoning operates most powerfully.

Folkbiology research by cognitive psychologists has produced a number of intriguing results. Children think in distinctive ways about the cognitive domain of living things, a domain which itself seems to develop in a distinctive manner from an earlier domain of animate (self-moving) things which includes some things that are not alive and excludes plants (Carey, 1985, 1988). Children of kindergarten age presume that each kind of organism possesses some unobservable property that explains the distinctive observable properties of that kind of organism and which preserves the specific identity of an organism through massive changes in its observable properties (Keil, 1989). This pattern of reasoning is very different with the same children's reasoning about artifacts. The specific identity of artifacts depends on their observable properties and, as children develop further, on those observable properties most relevant to the performance of their intended function. Specific identity is not preserved through change in these observable features: a screwdriver ground down to make an awl is not still "really" a screwdriver. The pattern

of thought that seems to imply the existence of some underlying, unobservable property that guarantees identity has been labeled "psychological essentialism" by Douglas Medin (Medin & Ortony, 1989), but here I will refer to it as "folk essentialism":

People act as if things (e.g., objects) have essences or underlying natures that make them the things that they are. Furthermore, the essence constrains or generates properties that may vary in their centrality. (Medin, 1989: 1476)

There is considerable controversy about whether these results should be interpreted as support for the existence of a "theory" of living things in young children or for "beliefs" about species and their essences (Downes, 1999). This, fortunately, is an issue that does not need to be settled for the purposes of this paper. I can also remain agnostic on the question of how specific the essentialistic pattern of inference is to the biological domain and certain others (Gelman & Hirschfeld, 1999). All I require for my argument here is that there exists an essentialist strategy of explanation in folkbiology. Just as Scott Atran has argued that the hierarchical taxonomy of early modern biology was derived from folk taxonomy (Atran, 1990), I argue that a cluster of biological concepts, such as the pre-Darwinian concept of species, the concept of human nature and the innateness concept, derive from essentialism in folkbiology. They reflect a way of thinking about living systems whose continuing grip on us is explained by the fact that it develops long before we are exposed to scientific biology.

Innateness and folk essentialism

It is uncontroversial that the scientific concept of species emerged smoothly from the pre-scientific practice of categorizing organisms into folk species. Folkbiological species categories are understood in terms of an underlying essence which is shared by all members of the species and which makes each individual the kind of organism that it is. This is precisely the "typological" perspective on species that Darwin had to displace in order to establish the gradual transformation of one species into another. Species are not types to which individual organisms more or less imperfectly conform, but abstractions from the pools of overlapping variation that constitute the actual populations of that species, a perspective that Ernst Mayr christened "populational thinking" (Mayr, 1976). Folk taxonomy allows traditional societies to interact effectively with the

common plants and animals of their region because at a particular time and place species often are clearly separated from one another. The limitations of folk taxonomy become apparent when working on larger geographical and temporal scales. Many species grade into one another spatially, and all do so temporally. When individuals exist who are intermediate between two species due to hybridisation or incomplete speciation, it is senseless to ask whether these individuals are “really” of one species or the other. That question presumes that the species is more than an abstraction from the varied individuals that compose it.

Elliott Sober has argued that the crucial element of Mayr’s distinction between ‘typological’ and ‘populational’ perspectives lies in their approach to individual variation (Sober, 1980). The typological perspective sees variation as deviation from a “natural state” that is the same for all individuals of that kind. Variant individuals are understood in terms of the natural state that they have failed to achieve. The Darwinian approach to variation, in contrast, regards species as pools of variation, has no concept of ideal type and treats the current average, modal or typical organism as a temporary reflection of an ongoing process of change. Unlike the typological perspective, the populational perspective does not lead to the expectation that species will be confined within a “circle of variation,” as so many of Darwin’s critics supposed must be the case. Looked at in this light, Darwin’s achievement lies as much in having transformed the question of the origin of species as in having answered it. The original “mystery of mysteries”⁴ was why different ideal types of organism are realized in different historical epochs. In Darwin’s hands, the question became how individual organisms, albeit clustered together as groups of more or less similar organisms, are succeeded by slightly different individual organisms. Throughout his work, Darwin can be found arguing against the idea that there is a normal or ideal type of each species. In *Descent of Man*, for example, he argues that medical representations of human anatomy are merely useful abstractions from a mass of slightly different arrangements of parts, and even slightly different collections of parts (Darwin, 1981 [1871]: 107–11).

Folkbiology regards essences as common to all members of a species and uses a natural-state model of variation in which variant individuals are seen as deviations from an ideal type. This much is supported by empirical research, as I briefly described in the last section. But I suggest

that there are other aspects of folk essentialism that have been less thoroughly investigated. First, essences are conceived as striving to realize themselves. A trait linked to an organism's essence will tend to reassert itself when the distorting influence that prevented its development is removed. Second, essences have normative overtones, so that variant individuals are not merely different but deviant. Individuals who deviate from their natural state are not as healthy and flourishing as normal individuals and no good can come of such deviation from the natural course of things. These claims are, of course, testable by the usual methods of folkbiology and cognitive developmental psychology, but in the absence of an existing empirical literature I can only provide anecdotal evidence in their support.⁵ Consider one of the most enduring of science fictions, H. G. Wells's *The Island of Dr Moreau*, in which the eponymous scientist sets out to turn animals into men. Dr Moreau's creations tend to revert to their original type, even in modern retellings of the story in which he has transformed their genomes! Eventually, they become monsters and destroy him. First published in the 1890s, *Dr Moreau* was a response to the new science of developmental mechanics (*Entwicklungsmechanik*), as well as a reflection of contemporary revulsion at the use of vivisection. Ten years earlier, scientists such as Wilhelm Roux had set out to transform embryology from a descriptive to an experimental science, manipulating physical and chemical variables to uncover their role in development and throw light on the mechanisms of cell differentiation and morphogenesis. Some of their results were the very stuff of science fiction, as when Hans Driesch succeeded in cloning the sea urchin by mechanically separating the products of the first cell division. Surely the production of humans in the laboratory was only a few years away! In the novel, Dr Moreau exploits the mechanical "laws of growth" envisioned by scientists like Roux to redirect the development of his animals toward the human form. The novel has been filmed three times,⁶ and by 1996 Moreau had become a genetic engineer, manipulating the DNA of his unfortunate victims. It is striking that Wells's plot is as satisfying to contemporary audiences, against this very different scientific background, as it was over a century ago. "The laws of growth" and "the genes" can play exactly the same role as extraordinarily powerful tools for deflecting nature from its course, but which are unable to change the essence of the organism. Moreau continues to lament that continual intervention is needed to prevent "the

beast” from reasserting itself, and his vision of creating an exact human copy still ends in death at the hands of his unnatural creations. The first of the two ideas that drive the plot forward, the idea of the essence reasserting itself, seems to me an inevitable concomitant of the explanatory role of essences in folkbiology. Essences explain the fact that all members of a species resemble one another because the essence *generates* the resemblance. The children in one of Frank C. Keil’s experiments are sure that a raccoon manipulated to resemble and behave like a skunk will give birth to baby raccoons, presumably because it will pass on to them the essence of raccoon rather than that of skunk (Keil, 1989). The generative power of essences is primarily used to explain reproduction, but it also explains *regeneration*, as when dyed hair grows back in its natural colour or a coppiced tree grows new trunks. It is this capacity for regeneration that is, I suggest, the folkbiological basis for the reversion of Moreau’s creations. The second idea, that individuals who deviate from their natural state are malformed or monstrous is all too familiar. The idea that health, happiness and morality can all be achieved by living in accordance with our nature did not need Rousseau to give it currency.

I have suggested that folk essentialism involves belief in unobservable essences shared by all members of a species, which explain the normal characteristics of the species, which reassert themselves when these characteristics are interfered with and deviation from which is viewed as normatively wrong. This complex of ideas can be conveyed in our own case by the term ‘human nature’. Human nature is both evidenced by and used to explain universal (or typical) human traits: “jealousy is found in all cultures—it’s part of human nature.” Human nature is used to argue for the futility of interference: “It’s no use trying to remove gender differences, they’re part of human nature.” Finally, the idea that ethical questions can be investigated by asking what it is to be truly or fully human has had followers from Aristotle to contemporary “perfectionism” (Hurka, 1993). The idea of human nature is, I suggest, the application of folk essentialism to our own case. Human nature is also a near synonym for the *innate* features of human beings. If you give popular-science talk and assert that, for instance, addictive behaviour is part of human nature, you can count on your audience interpreting this to mean that addictive behaviour is innate. It is hard to change, found in all cultures, and so forth. Conversely, if something is innate, then it is at least reasonable to refer to

it as a part of human nature. I think this is true even of diseases that are described as innate. We are "naturally" disposed to suffer from some diseases, such as those of old age. If innateness differs from human nature it is, perhaps, in having weaker normative overtones. I conclude, then, that the vernacular concept of innateness is also an expression of folk essentialism.

Doing without innateness

The innateness concept continues to promote the conflation of different biological properties in the ways that brought it into disrepute in animal behaviour studies fifty years ago. Innateness allows writers to move illicitly from the view that a trait has an adaptive history to the view that it is insensitive to environmental influences in development. Popular discussions of rape or sexual jealousy inspired by contemporary evolutionary psychology assume that we have to live with these aspects of "human nature" despite the clearest theoretical commitment by evolutionary psychologists to the dependence of evolved traits on the developmental environment. Conversely, developmental fixity is seen as a precondition of evolutionary explanation despite the massive evidence to the contrary. Social constructionists applaud research that shows developmental plasticity because they believe it removes the trait in question from the biological realm. In another set of invalid inference, universality, in either of its senses, is taken to be the hallmark of adaptive evolution, hence the efforts devoted by some evolutionary psychologists to documenting universality and by social constructionists to documenting cultural difference. The continuing focus on universality against the background of universal acceptance that evolution produces polymorphic outcomes is, I believe, due in no small part to the continuing use of theoretical constructs like innateness and human nature that conflate these distinct biological properties.

It is, of course, possible to define 'innate' in a way that makes use of only some limited set of its connotations. But all three aspects of the innateness concept are important and however the term 'innate' is redefined, terms will be needed to refer to the aspects of the concept this stipulation has excluded. In fact, each of these three broad ideas needs to be further subdivided to mark critical biological distinctions. Furthermore, 'innateness' is a term in common use, and one that represents a highly intuitive way of thinking about living systems. This existing system of thought acts

as a sink that draws new, stipulative usages back towards the established use. Substituting what you actually mean whenever you feel tempted to use the word 'innate' is an excellent way to resist this slippage of meaning. If a trait is found in all healthy individuals or is pancultural, then say so. If it has an adaptive-historical explanation, then say that. If it is developmentally canalized with respect to some set of inputs or is generatively entrenched, then say that it is. If the best explanation of a certain trait difference in a certain population is genetic, then call this a genetic difference. If you mean that the trait is present early in development, what could be simpler than to say so? If, finally, you want to 'blackbox' the development of a trait for the purposes of your current investigation then saying so will prevent your less methodologically reflective colleagues from supposing that you think the trait is . . . innate.

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NOTES

1. Elements of this critique have been made many times by many authors in the last sixty years. I myself was drawing on (Bateson, 1991; Gray, 1992; Johnston, 1987; Lickliter & Berry, 1990; Oyama, 1990).
2. A conception of the unit of mental evolution from classical ethology which resonates strongly with the idea of a 'mental module' found in contemporary evolutionary psychology (Barkow, Cosmides, & Tooby, 1992).
3. The 'genetic program' idea has some pitfalls of its own. See (Oyama 2000a, b; Oyama, Griffiths and Gray, 2001; Griffiths, 2001).
4. The phrase is Sir John Herschel's and occurs in a call to biologists to resolve the great question of the origin of species (Herschel, 1966 [1830]). It is used without acknowledgement on the first page of *Origin of Species* (Darwin, 1964 [1859]).
5. What follows looks very much like a traditional 'analysis' of the concepts of essence, human nature and innateness by appeals to 'linguistic intuition'. I am, indeed, trying to analyse these concepts, but I make no pretension to have access to a special realm of conceptual truths. This is speculative folkbiology built on anecdotal evidence.
6. In 1932 as *Island of the Damned* with Charles Laughton in the title role, and twice under its original title, with Kirk Douglas as the 70s Moreau still resorting to vivisection and Marlon Brando in 1996 injecting his victims with human DNA.

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