Innateness

Some business...

We have two more class meetings (besides this one).

Next week we meet on Monday *and* Wednesday.

Then the final will be on October 25 from 12:00-13:30 in room A-407.

On our Wednesday meeting next week, we'll spend the first half discussing the paper, then the second half discussing what will be on the exam.

follow up from last time

“antecedent strengthening”

I said that if “A □ B” is true, so too is “(A & C) □ B”. This is called “antecedent strengthening.

It’s one criticism of the material conditional, because...

(a) “If I strike the match, the flame will catch fire”

may be true, but

(b) “If I strike the match and the match is wet, the flame will catch fire”

may be false.

Given the semantics of the material condition, however, if (a) is true, then (b) must be true too.

Someone asked whether this is right, and I should have explained why in more detail.

So...

semantics of material conditional

A	□	B
T	**T**	T
F	**T**	T
T	**F**	F
F	**T**	F

Now we add “C” to “A □ B”.

C can be either true or false.

Conditional on “A □ B” being true, it doesn’t matter what the truth value of C is. “A □ B” will still be true.

semantics of material conditional

A	□	B
T	**T**	T
F	**T**	T
T	**F**	F
F	**T**	F

we’re not interested in row 3 now

A	□	B
T	**T**	T
F	**T**	T
~~T~~	~~**F**~~	~~F~~
F	**T**	F

A	□	B
T	**T**	T
F	**T**	T
F	**T**	F

in fact, we can combines rows 2 and 3

A	□	B
T	**T**	T
F	**T**	T
F	**T**	F

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A	□	B
T	**T**	T
F	**T**	

(Since all that matters is that A is false; it doesn't matter what the truth-value of B is.)

now imagine C is true

(A	&	C)	□	B
T	T	T	**T**	T
F	F	T	**T**	

now imagine C is false

(A	&	C)	□	B
T	F	F	**T**	T
F	F	F	**T**	

There has been a *very* long debate in philosophy about how much of our behavior (including mental behavior) we are born with and how much we learn from our environment.

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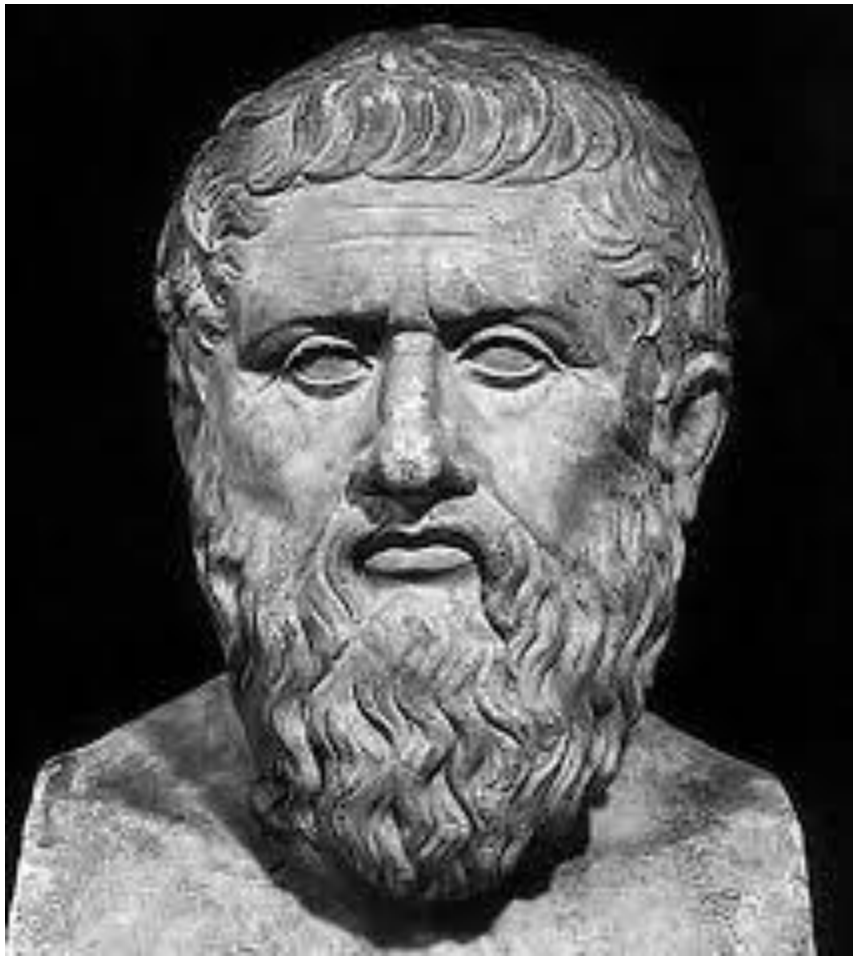
Avoiding some important nuances...

John Locke (1632-1704)

David Hume (1711-1776)

Lev Vygotsky (1896-1934)

Plato (429?-347 BCE)



René Descartes (1596-1650)

But what does “innateness” *mean*?

Samuel, R. (2004) “Innateness in Cognitive Science,” in *Trends in Cognitive Sciences*, 8(3): 136-141.

conceptual analysis

Samuels's paper is an example (sort of) of "conceptual analysis".

In general, to "do" conceptual analysis is to take some everyday or poorly defined concept and attempt to make it more precise.

Typically, this is done by attempting to articulate a set of conditions that are necessary and jointly sufficient for some entity (broadly construed) to have or exhibit some property.

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Sufficient condition: A condition that, when satisfied, means you have some other property

Necessary condition: A condition that must be satisfied for you to have some property.

For instance, the property “is a prime number” can be captured by a set of necessary and sufficient conditions

Some entity is a prime number if and only if: it is (a) a natural number, (b) greater than 1, and (c) only divisible by itself and 1.

Remember, we use “if and only if” to indicate necessary and sufficient conditions.

What is a necessary but not sufficient condition for being a triangle?

What is a sufficient but not necessary condition for being a triangle?

Samuels wants to develop a similarly precise account of what “innateness” means, at least in cognitive science.

I should add, Samuels allows that our scientific account of “innateness” may not perfectly match our “commonsense” account, which he thinks is fine.

Samuels motivates his article by describing the various contexts in which discussion of “innateness” in cognitive science arises.

(1) Some claim language is (in some sense) innate (Chomsky)

(2) Others claim theory of mind is innate (Leslie)

(3) Still others claim numerical reasoning is innate (Spelke)

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Sign Language in Nicaragua

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Prior to the late 1970s, children who had been deaf since birth did not go to school.

They instead stayed at home, often developing a rudimentary “home sign” with their parents and family members.

Starting in the late 1970s, schools for deaf children opened up.

The older students who enrolled in these schools communicated with each other in a rudimentary language.

This is called a “pidgin” language, though typically pidgins are spoken languages.

The contrast here is with what linguists call a “fully-fledged” language with complex grammatical structure.

The problem is that, if you haven't been exposed to a fully-fledged language by around age 7, you pass a "critical period" and your ability to learn *any* language starts to disappear.

That's why the older students couldn't develop a language more complicated than a pidgin language.

What's interesting is that the younger students *did* develop a fully-fledged language.

Apparently, what happened was that they were exposed to the older students' pidgin language and filled-in the complex grammar that was missing from that language.

This is taken to be evidence that we come pre-equipped with some “innate” rules of grammar, since the language the younger kids developed was more complex than the language they were exposed to.

If the complex grammatical structures weren’t in the pidgin, then the younger students’ minds must have contributed those structures to the language.

But if this shows that language is in some sense “innate,” as many argue, then what sense of “innateness” are we adopting here?

Likewise, Spelke and Kinzler discuss areas of "core knowledge systems" that all humans possess:

(a) movement of inanimate objects (folk physics)
(b) agents and goal-directed behavior (folk psychology)
(c) numerical reasoning
(d) spatial reasoning

If these areas of core knowledge are “innate” (as Spelke suggests, though she doesn’t use the i-word), then what does that mean?

If these areas of core knowledge are “innate” (as Spelke and Kinzler suggest, though they don’t use the i-word), then what does that mean?

That’s the sort of question that Samuels wants to answer.

Samuels considers a number of proposals.

He starts off with five that are inspired by work in biology. Then, later, he considers proposals that are more specifically psychological.

(1) a trait is innate if and only if it is “not acquired”

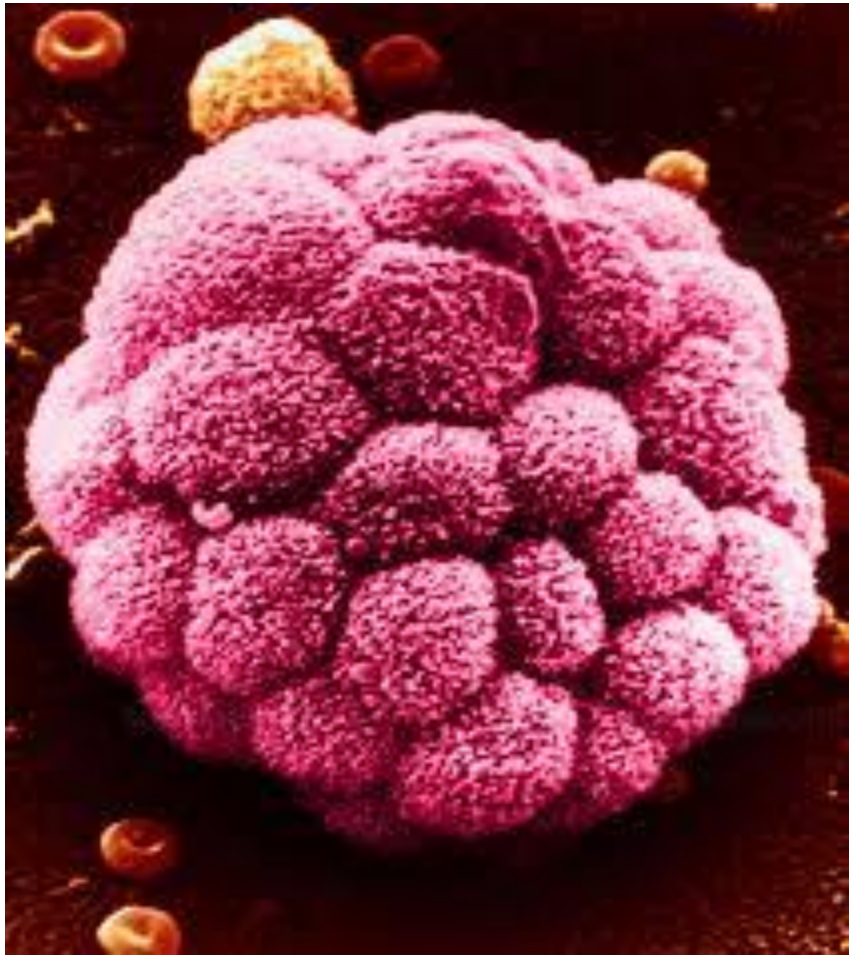
Why does he reject this approach?

Why does he reject this approach?

Samuels thinks treating a trait as innate if and only if it is not acquired is far too broad to track how “innateness” is used in cognitive science.

“...consider the following ‘minimal notion’ of acquisition: a characteristic is acquired by an object (e.g. an organism) if and only if there is some period of time when the object has the characteristic in question but some prior period when it does not. This is a perfectly sensible notion of acquisition and yet clearly insufficient for drawing the innate/non-innate distinction because, in this minimal sense, all cognitive structures are acquired” (137).

For instance, you used to look like this:



At that point in your existence, you certainly had no cognitive traits at all. So, if what it means for a trait to be not innate is that is was “acquired” at some point, and we take “acquired” to just mean that there was a point at which you didn’t have the trait, but now you do have the trait, then *all* of your cognitive traits are acquired.

If our goal is to track scientific usage, then that account of innateness clearly will not work.

(1) a trait is innate if and only if it is “not acquired”

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(2) a trait is innate if and only if it is "present at birth"

Samuels thinks presence at birth is neither necessary nor sufficient for innateness.

Why?

It is not necessary: Certain traits that are not present at birth nevertheless are plausibly characterized as innate.

For instance, it is plausible to say that secondary sexual characteristics (e.g., pubic hair, breasts) are innate even though they are not present at birth.

So perhaps we should allow cognitive traits to be "innate" even if not present at birth.

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Samuels discusses Lecanuet et al. (1993) in which a fetus learned to discriminate to different human voices.

Do we really want to say this trait is thus innate, since it will be present at birth?

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(3) a trait is innate if and only if internally caused

In their book *Rethinking Innateness*, Elman et al. argue that a trait is innate if and only if it is “the produce of interactions internal to the organism”.

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But what does this mean?

Samuels points out that no trait (cognitive or otherwise) emerges *purely* from "internal interactions".

Even a staunch nativist endorses the "Interactionist Thesis," the idea that all traits develop as a result of an interaction between an organism and its environment.

Samuels thinks this Interactionist Thesis is "little more than a banal truism that holds for all human traits. A foetus 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." (137).

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Let’s focus on the idea that “genetic determination” could mean that a gene entirely causes some trait (rather cognitive or not).

Konrad Lorenz (1903-1989)

But Samuels says this clearly won't work.

No gene "entirely causes" a trait to appear. All traits are the result of interactions between genes and the environment.

For instance, imagine a zygote that is genetically identical to you that "developed" in a petri dish filled with water.

“...the folly of this proposal has long been recognized, as complex biological traits are not caused by genes alone but depend on interactions between genetic and non-genetic factors. This is simply a variant of the Interactionist Thesis mentioned earlier” (138).

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(5) a trait is innate if and only if developmentally invariant

“invariant” means that there’s very little variation

Here Samuels draws on some work of Elliott Sober. Roughly:

“a trait is innate for a given genotype if and only if that phenotype will emerge in all of a range of developmental environments”

Here, the “range” of environments refers to the environment that a member of the species *typically* develops within.

This might seem plausible.

It allows us to acknowledge that a trait doesn't need to be "present at birth" or "genetically determined" to be innate.

And it makes sense of the fact that innate traits are universal, or close to it.

For instance, humans develop language if they grow up in a typical environment for the species, that is, one which exposes them to language.

Thus, language is innate, according to the developmental invariance account.

Likewise, humans develop secondary sexual characteristics if they grow up in a typical environment for the species, that is, one with sufficient nutritional resources.

Thus, secondary sexual characteristics would be innate according to the developmental invariance account.

But what’s the problem?

Is your belief that water is wet innate? Or did you have to learn it?

The issue is that pretty much everyone who develops in an environment typical of the species will form the belief that water is wet.

So, according to the developmental invariance account, we'd have to say the belief is innate, which seems rather strange.

“The problem arises in the case of traits that are highly invariant, although only because the environmental conditions required to learn them are ubiquitous. So, for instance, it is plausible to maintain that pretty much every human acquires the belief that water is wet under normal environmental conditions and, moreover, that we learn it. But if this is so, then the belief that water is wet can be both learned and innate on the invariance account: a conclusion that might suffice to show that the account is untenable” (138-139)

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Since this was unsuccessful, he attempts to draw on concepts from cognitive science itself to characterize innateness in cognitive science.

The proposal he likes most is this:

(6) a trait is innate if and only if it is "psychologically primitive"

What does this mean?

"...innate cognitive structures are 'psychologically primitive' in (roughly) the sense that they are not acquired by cognitive/psychological processes. To put the proposal in a slightly different way: although innate cognitive structures are acquired in the minimal sense, it is not at the cognitive/psychological level(s) of explanation– but some lower (biological) level – that an account of how they are acquired is to be found. In short, innate cognitive structures are the ones whose acquisition psychology cannot explain" (139).

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Consider, for instance, a human's behavior toward sweet foods, bad smells, loud noises, sexual arousal, and so on.

These are behaviors that one could in principle explain at a purely neurological level, as the result of (say) the release of dopamine.

You don’t need any high-level cognitive theory to explain why, for instance, someone likes the taste of food that is sweet or avoids smells that are bad.

Any objections to this idea?

What's a bit strange (to me) about what Samuels says here is that he wants to use resources from cognitive science to characterize innateness, but then he says innate (cognitive) traits are those that don't require cognitive science to explain.

"In short, innate cognitive structures are the ones whose acquisition psychology cannot explain" (139).

Does that make sense?

In fact, Samuels's characterization of Elliott Sober's position is not quite right.

In the article Samuels cites, Sober does provide the if and only if that Samuels mentions: "a trait is innate for a given genotype if and only if that phenotype will emerge in all of a range of developmental environments"

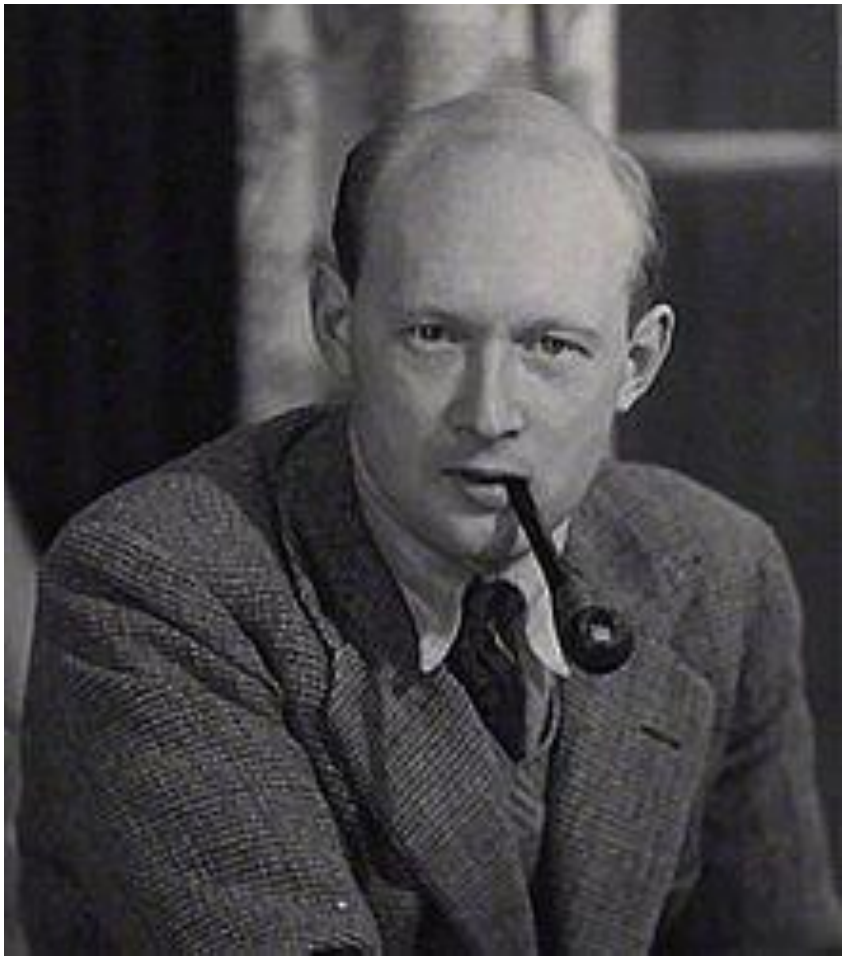
...but that was a mistake.

The point that Sober is making in the article as a whole is that it is meaningless to say some trait is “innate” or not.

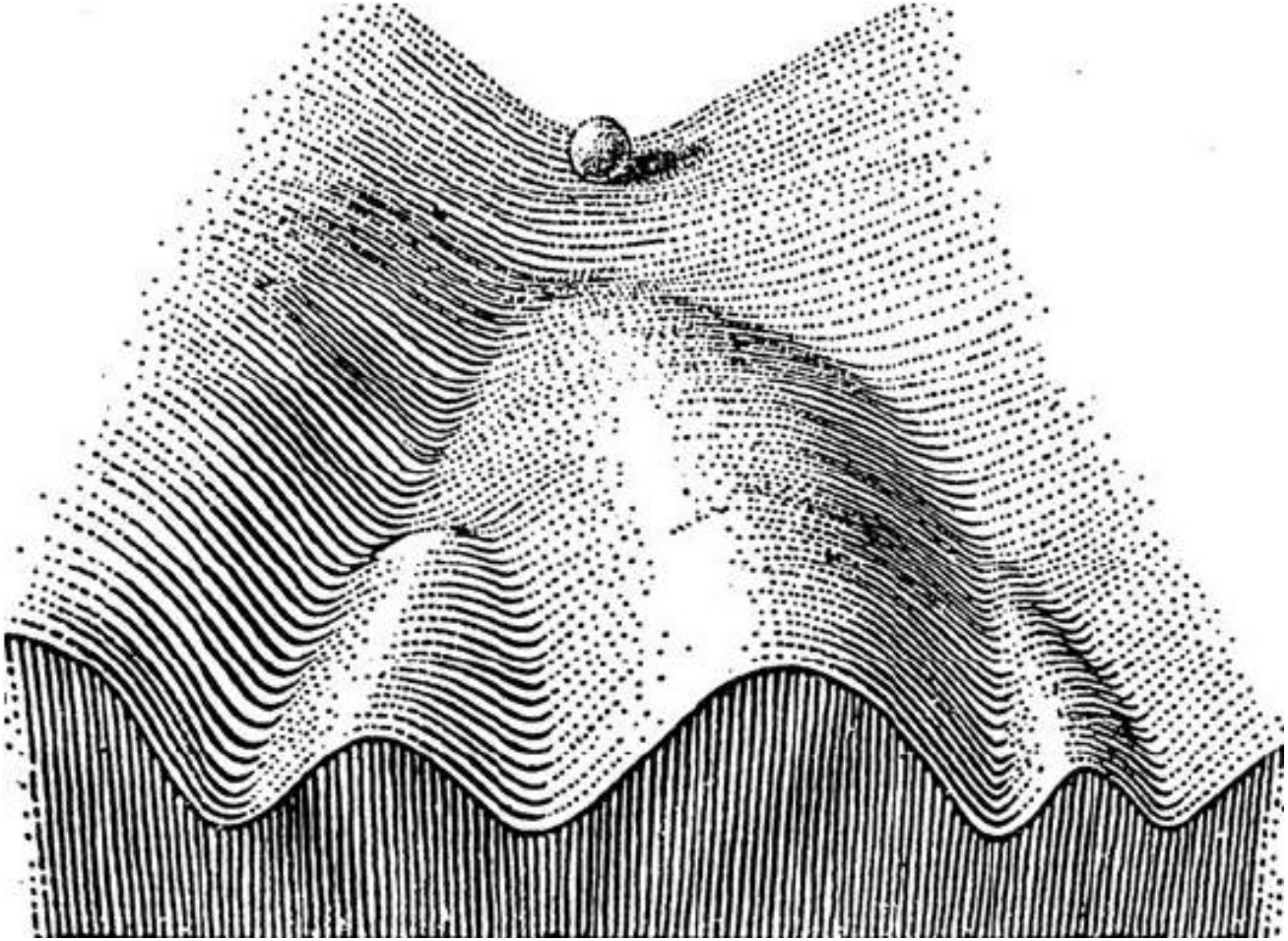
Innateness should also be understood as a *relative* concept; a trait *is more or less innate* than some other trait.

In particular, some trait *T* is more innate than some trait *T'* if and only if *T* emerges in a wider range of environments than *T'*.

Conrad Waddington (1905-1975)



“epigenetic landscape”



For instance, some birds will learn their species song only if raised by members of their own species.

Some birds will learn their species song when raised by members of their own species or other species.

And some birds will learn their species song when exposed to no birdsong at all.

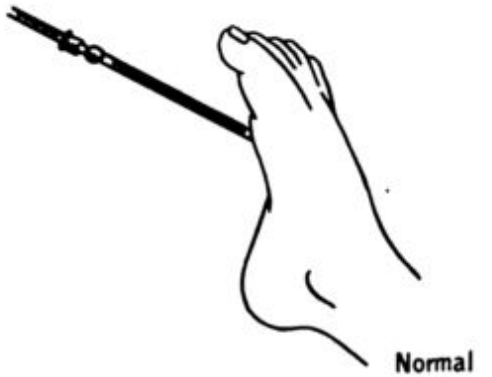
So we'd say that birdsong is more innate in members of the third species than the second, and more innate in members of the second species than the first.

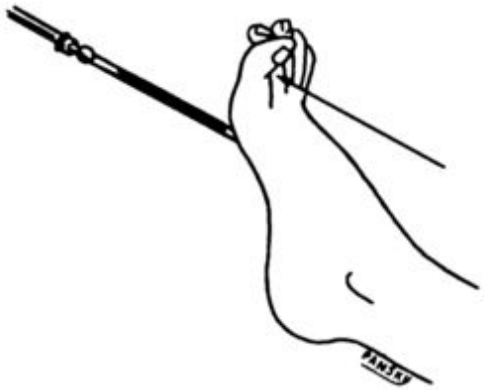
We don't say birdsong is innate (or not) in *any* species.

How would this apply to human cognitive traits?

To say language is innate or acquired is mistaken. Rather, you say language is more (or less) innate than some other trait you are interested in.

So construed, what is language more innate than? And what is it less innate than?





Positive (+) Babinski sign
(dorsiflexion of big toe)

Who has a favorite account of innateness?

What is it?

an alternative view

Griffiths, P. “What Is Innateness?”, in *The Monist*, 85(1): 70-85.

Let’s just not use the word “innateness”. If you mean present at birth, just say that. If you mean developmentally invariant, just say that. And so on.

Let’s just not use the word “innateness”. If you mean present at birth, just say that. If you mean developmentally invariant, just say that. And so on.

Is this the way to go?