

Against Morgan's Canon

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Introduction

Despite a variety of critiques (e.g., de Waal 1999; Sober 1998, 2005; Fitzpatrick 2008; Andrews and Huss 2014; Meketa 2014; Starzak forthcoming), the principle known as *Morgan's Canon* retains a significant hold on modern scientific and philosophical discussions of non-human animal (henceforth, “animal”) cognition and behavior. Proposed by the late nineteenth century British philosopher-psychologist, Conwy Lloyd Morgan—generally regarded as the “father” of modern comparative psychology—it states that:

In no case may we interpret an action as the outcome of the exercise of a higher psychological faculty, if it can be interpreted as the outcome of the exercise of one which stands lower in the psychological scale. (Morgan 1894: 53)

Morgan saw this principle as necessary for scientifically rigorous investigation into the minds of animals. It went on to exert enormous influence on the subsequent development of comparative psychology, though not always in ways consistent with Morgan's original intent (Costall 1993; Thomas 1998; Fitzpatrick and Goodrich forthcoming).

My focus will be on how Morgan's Canon has been interpreted and applied by psychologists and philosophers since Morgan's day, particularly over the last few decades, and whether or not it should continue to be accepted as a fundamental guiding principle for the study of animal cognition and behavior—to which the answer will be an emphatic “no”. However, one problem with discussing the place of the Canon in the contemporary literature is that it has been explicated and interpreted in several different ways. The distinctions between these different versions of the Canon have not been fully appreciated, even in the most careful discussions. I'll first distinguish between four formulations the Canon that one can find explicitly or implicitly in the literature. I'll then argue that each of these canons is unjustified and unnecessary. We will see that comparative psychology has absolutely no need for Morgan's Canon, on any of its current interpretations, and that the field would be better served by an alternative principle that I call *Evidentialism* (Fitzpatrick 2008).

Four Canons

Morgan's Canon remains widely accepted primarily because it is seen as a bulwark against a natural bias of human beings towards explaining animal behavior in terms of sophisticated, human-like cognitive capacities, when the relevant behavior might in fact be the product of much less sophisticated causes. Morgan himself criticized the tendency of his contemporaries to reflexively attribute instances of animal learning, such as a dog learning to open a latched gate using its nose, to a sophisticated faculty of “reason” (e.g., an abstract conceptual understanding of the workings of the latch), when the behavior might be the product of a much less sophisticated process of trial and error (where the

animal merely forms an association between a given action and achieving a desired outcome). Such a bias, it is argued, still afflicts modern discussions of animal intelligence, particularly in the popular media, but also in parts of the scientific literature. The Canon serves as a counterweight, ensuring that researchers don't overestimate the capacities of animals. But if this is the problem the Canon is meant to cure, exactly *what* treatment is it meant to provide?

The strongest formulation in the literature has the most tenuous relationship to Morgan's original words, but was the interpretation that became most prevalent in the decades after Morgan proposed the principle (Costall 1993; Thomas 1998). Though, as stated, Morgan's Canon admits for the possibility of accepting "higher" explanations of behavior, given appropriate evidence (see also Morgan 1903: 59), some interpreted it as banning entirely what are derisively referred to as "anthropomorphic" explanations of behavior. This is the *Prohibitive Canon*.

Here, the terms "higher" and "lower" are synonymous with "cognitive" and "non-cognitive", respectively. The idea is that cognitive explanations of behavior—ones that invoke internal mental states such as thoughts, beliefs, emotions, desires, or other representational states and processes—are to be viewed with inherent suspicion, because they are "anthropomorphic". Since anthropomorphism is to be avoided at all costs, animal behavior is always to be explained *without* reference to such things. Such was the attitude of the behaviorist movement in the early decades of the twentieth century, some of whom co-opted Morgan as their intellectual forefather and presented the Canon in this light. Here is a textbook rendition from this period:

In Morgan's case, the principle amounted to this. Where there is a pattern of animal behavior which must be explained, both as to form and to origin, and in the simplest, but at the same time, most adequate way, the experimenter should appeal to factors observable in the situation in which the animal has been placed, in the behavior itself, and in the machinery by which the behavior is made possible. It is not incumbent on him to pass over these factors in order to appeal to a verbal construct, to a mind, or to any other kind of mental factor which lies outside of, behind, or within the behavior-situation. (Griffith 1943: 322)

As the popularity of behaviorism has receded and cognitive approaches have become widely accepted, the Prohibitive Canon is much less popular than it once was, but one can still find researchers advocating something very close to it. Clive Wynne (2007) is perhaps the most prominent contemporary defender of a categorical "anti-mentalism" (as he refers to it), though Wynne is careful to distinguish his view from the historical Morgan.

Today, the most common articulations of the Canon are not flatly prohibitive, but rather correspond to what I want to call the *Conservative Canon*. For example:

[I]f principles of associative learning or habit formation operating on a primary representation may account for putative metacognition data, then it would be inappropriate to explain such data based on metacognition (i.e., based on a secondary representation); the burden of proof favors primary representations, by application of Morgan's canon... (Crystal and Foote 2009: 2)

Following the principle of parsimony, also known as Morgan's Cannon or Ockham's Razor, we should prefer the simplest explanation for pointing and the reaction to it. A reaction without insight seems to be a simpler explanation than with insight. Of course, one has to keep an open mind for data that justify more complex interpretations for pointing behavior and the reaction to it than the interpretation without insight. (van Rooijen 2010: e8)

Here, the terms "higher" and "lower" are generally understood in terms of degrees of cognitive sophistication. For instance, purely physiological explanations of behavior—e.g., in terms of reflexes or innate releasing mechanisms—and other non-cognitive explanations—e.g., in terms of the most basic forms of associative conditioning—are to be understood as "lower" than cognitive explanations, such as those that involve some form of means-end reasoning, say. Moreover, explanations in terms of first-order cognitive processes are to be regarded as "lower" than those in terms of more sophisticated higher-order processes, such as the ability to reason about one's own mental states (metacognition) or those of others (mind-reading). As the second passage above illustrates, this notion of cognitive sophistication is often dressed up in the language of simplicity, where explanations in terms of less sophisticated processes are taken to be "simpler" or more "parsimonious" than those in terms of more sophisticated ones. Crucially, this principle allows that "higher"—i.e., relatively cognitively sophisticated—explanations of behavior can potentially be accepted. However, when we have a choice between more cognitively sophisticated and less cognitively sophisticated explanations, we should adopt the least

sophisticated explanation available. The Conservative Canon can thus be viewed as a *decision principle*, which tells us how to choose between competing explanations for behavior: we should always default to the least cognitively sophisticated explanation consistent with the available data.¹

Though most explicit presentations of the Canon can be seen as instances of the Conservative Canon, many advocates don't actually follow it in practice. Instead, what they often seem to abide by is a weaker principle that I want to call the *Restraining Canon*. The distinction between these two principles coincides with a largely ignored ambiguity in Morgan's original framing of the Canon. When Morgan says that we shouldn't endorse higher explanations for behavior when lower ones are available, are we to actively *endorse* the relevant lower explanation, or are we to merely *withhold judgment* until future evidence enables us to decide between the respective higher and lower explanations? Morgan actually equivocated on this, sometimes using the Canon to defend lower accounts of behavior, sometimes urging us to merely withhold acceptance from a higher account, given the availability of a lower one (compare Morgan 1894: 248, 302, 370). In contrast to the Conservative Canon, then, the Restraining Canon doesn't say that we should automatically endorse the lower explanation when higher and lower accounts are consistent with the available behavioral data. Rather, it says that when a lower explanation is available, we must not accept a higher one. We should be especially restrained in our endorsement of higher explanations, being sure to eliminate lower explanations before accepting them. Here are some examples that seem to be consistent with this weaker formulation:

[I]t is our intention to highlight the principle enshrined in Morgan's Canon; namely that accounts of animal behavior in terms of higher-order mental functions should only be accepted when explanations in terms of simpler mechanisms are unavailable. (Dwyer and Burgess 2011: 361)

...we must not abandon Morgan's canon. For example, we should not accept the idea that honey-bees have such capacities before eliminating every other possibility. (Manning and Dawkins 1998: 297)

The final interpretation of the Canon that I want to discuss is the *Cautionary Canon*. I've not seen it stated explicitly, but it does capture a possible way thinking about the role of the Canon in modern comparative psychology. In contrast to the three just discussed, this Canon is not really a methodological principle at all. It doesn't give any specific methodological guidance; it is just a cautionary exhortation—the sort of thing that professors pound into the heads of their students in introductory lectures, but not a principle to be employed in actual research. It just serves to emphasize that the history of research into animal cognition has been marred by cases—the infamous case of Clever Hans, for instance—where researchers leapt too quickly to higher-level accounts of animal behavior, without adequately considering the possibility of lower-level processes being at work. In this respect, the Canon is merely a pedagogical tool, reminding future researchers not to make the same mistakes as their forebears.

The Prohibitive Canon

The categorical anti-cognitivism embodied in the Prohibitive Canon has received much criticism (Allen and Bekoff 1997; Keeley 2004; Andrews 2015), so I won't rehearse all the arguments against it. The key point is that labelling cognitive explanations of non-human behavior “anthropomorphic,” where this is understood as a conceptual or inferential mistake, just begs the question by assuming that cognitive processes are uniquely human. It is surely an empirical question whether such processes exist in other species; not something that can be resolved by methodological fiat.

Of course, anti-cognitivists usually assert that internal mental processes in other species cannot be studied scientifically, because they are intrinsically unobservable or because we cannot describe them in a way that isn't inextricably tied to human language and concepts (Blumberg and Wasserman 1995; Wynne 2007). The first claim forgets that unobservable theoretical entities are a common component of modern science generally (consider quarks and Higgs bosons), while the second ignores the fact that modern cognitivists typically assume a broadly functionalist perspective, according to which mental states and processes are defined by their characteristic functional or causal roles. Crucially, such definitions can be seen as analogous to (and no more anthropomorphic than) the causal-role definitions that physicists provide for things like Higgs bosons. Just as physicists can legitimately posit the existence of such unobservable theoretical entities in order to explain things that we do observe, so cognitivists can legitimately posit the existence of a kind of episodic memory in scrub jays, say, (understood as the capacity to store and utilise information about “what” events occurred “where” and “when”) in order to explain their observable behavior (e.g., Clayton and Dickinson 1998).

In short, there is no reason whatsoever to think that cognitive states and processes cannot be attributed to animals in a scientifically legitimate manner, and hence no reason to prohibit such attributions.

The Conservative Canon

Here is a typical presentation of the Conservative Canon:

Unless clear evidence is provided that a more complex cognitive process has been used, C. Lloyd Morgan's famous canon of parsimony obliges us to assume that it has not; we must then conclude that a simpler learning process can account for the learning. (Wasserman and Zentall 2006: 4).

Suppose we are concerned with how an animal learns to perform a particular task. We consider various types of learning process that can account for the observed behavior—e.g., basic associative learning versus a more sophisticated form of means-end reasoning—but we are unable to turn up decisive evidence that discriminates between them. Wasserman and Zentall would appear to have us “conclude” that it must therefore be the lower, associative learning process at work. But what is the status of this conclusion? Are proponents of associative learning to declare victory and the field to move on to some new topic? That hardly seems appropriate, and I seriously doubt that most of those who espouse something like the Conservative Canon would recommend such a verdict. So, what exactly *are* we to take away from a case like this? Perhaps the conclusion that it is the lower learning process at work and the higher one is absent is just

a provisional one, to be accepted pending future research into the matter? That sounds better, but notice how *unempirical* it is. We are to accept, albeit provisionally, an associative learning explanation, not because it is better supported by the data, but because the data does not discriminate between it and one that invokes a more sophisticated process.

Crucially, the usual rationale offered for Morgan's Canon—the supposed tendency to attribute sophisticated cognitive processes to animals on the basis of insufficient evidence, or without proper attention being paid to alternative, less cognitively sophisticated explanations—actually undercuts this aspect of the Conservative Canon. Why is it an appropriate response to this problem to enshrine a default bias towards lower explanations? That seems like overkill, given that one could just remain neutral if there is insufficient evidence to decide between higher and lower explanations. Moreover, if over-attribution of cognitive sophistication to animals is an error that needs to be corrected, then so is under-attribution (de Waal 1999; Sober 2005; Andrews and Huss 2014). The Conservative Canon clearly increases the chance of making the latter error: it asks us to always favor the least cognitively sophisticated explanation, even when there is no empirical reason to do so. Hence, the logic thought to motivate Morgan's Canon actually runs against the Conservative Canon.

I think this is one reason why many that express the Conservative Canon don't actually abide by it in practice. However, there clearly are researchers genuinely committed to the principle. Carruthers (2008) argues that the existing experimental results that supposedly indicate meta-cognitive capacities in animals can be explained in terms of purely first-order processes. Hence, “we should, at present, refuse to attribute

meta-cognitive processes to animals. This inference is grounded in an application of Morgan's Canon" (2008: 59). While this might sound like an instance of the Restraining Canon, Carruthers' position isn't one of agnosticism. Though he remains open to the possibility of future work establishing the existence of meta-cognition in animals, the "inference" he refers to is to the (at least provisional) conclusion that such capacities are in fact absent. This is an example of what I call "armchair denialism", where the mere ability to *construct* a hypothetical lower explanation for the relevant behavioral data is enough not only to suggest that the higher explanation shouldn't be accepted—or that the relevant experiments might not show what they are claimed to show—but that the lower one should be accepted *instead*. It is worth considering, then, what justification, if any, can be given for the Conservative Canon.

As we've seen, expressions of the Conservative Canon usually also include the claim that explanations in terms of less sophisticated cognitive processes are somehow "simpler" or more "parsimonious". Hence, the alternative to justifying the Conservative Canon in terms of concerns about over-attribution is to argue that it is just a special case of *Ockham's Razor*—the general rule of scientific method that simpler explanations ought to be preferred to more complex ones, other things being equal.

This appeal to simplicity is problematic on many levels, however (see also Mikhalevich this volume). We shouldn't just take it for granted that it *is* a legitimate rule of scientific method that simpler theories or explanations are to be preferred, other things being equal. Though many scientists do espouse principles like Ockham's Razor, it is far from clear that simplicity really does play a significant role in theory evaluation, and it is certainly not a trivial problem to explain *why* it is reasonable to choose between rival

theories on such grounds. I am sympathetic to Sober's (1994, 2015) claim that when considerations of simplicity *appear* to play a legitimate role in science, it is typically some other consideration that does the real epistemic work (Fitzpatrick 2009, 2015).

In any case, why should we regard explanations in terms of less sophisticated processes as necessarily simpler? Even if one accepts that the level of cognitive sophistication attributed can be regarded as one way in which rival psychological theories might be evaluated for their comparative simplicity, there are multiple *other* ways of assessing relative simplicity, many of which conflict with the recommendations of the Conservative Canon. Morgan (1894: 54-55) himself argued that the Canon ran against a preference for simplicity because it was generally simpler to explain animal behavior in the same way as one would explain similar behavior in a human being. Similarly, as Sober (2005) and de Waal (1999) point out, considerations of evolutionary parsimony—minimizing the number of independent evolutionary changes that have to be posited—can sometimes favor attributing higher processes to animals, if, for instance, this enables us to explain the emergence of similar behaviors in humans and a closely related primate species, say, with the evolution of a single higher cognitive mechanism in a common ancestor of both species, rather than the independent evolution of two different mechanisms. In addition, an explanation that attributes more sophisticated learning capacities to an animal might be said to “simpler” than an associative learning explanation, if the latter requires us to make more assumptions about the animal's previous experiences with the relevant task. Hence, whatever one thinks about the legitimacy of appeals to simplicity in comparative psychology, there are *many* different ways of measuring the relative “simplicity” of behavioral explanations. Given that the

Conservative Canon prioritizes *one* particular kind of simplicity—level of cognitive sophistication—over others, we need another justification, aside from a completely general appeal to simplicity, for the Conservative Canon.

Shettleworth (2012: 12-13) suggests that the Canon makes sense insofar as it leads us to prefer explaining behavior in terms of lower processes—“habituation and classical conditioning”, for instance—that we already know are widely distributed in the animal kingdom, rather than in terms of more sophisticated processes that are likely to be much rarer in nature. Similarly, Carruthers (2008: 59) argues that it makes sense to default to a purely first-order explanation of the putative meta-cognition data, given the plausible rarity of meta-cognitive capacity in nature, which follows from the fact it requires that first-order reasoning is already in place and because it is “extremely cognitive demanding.” The idea seems to be that, given that lower processes are more common in nature, the antecedent probability of lower explanations is greater than that for higher explanations.

However, Shettleworth’s claim seems to beg the question, since it is not entirely clear what role associative learning, as she understands it, plays in explaining animal behavior (Meketa 2014). Researchers like Randy Gallistel (2000) have long been arguing that traditional models of associative learning can’t even explain the results of standard classical and operant conditioning experiments, which are better accounted for by much richer information-processing models. Much the same is true in Carruthers’ case. Even if he is right that meta-cognition is particularly cognitively demanding, research into this capacity is at such an early stage that we just have no idea how widely distributed this capacity is likely to be in the animal kingdom—it might turn out to be quite widely

distributed because it confers peculiar evolutionary advantage. Moreover, Carruthers' argument loses its force when we consider primates closely related to humans, who are surely more likely to possess such a rare capacity, given their evolutionary proximity to a species known to have it.

To be clear, there are cases where relevant background information about the species in question—level of neurological complexity, type of ecological niche, information about closely related species, etc.—may legitimately lead us to elevate the antecedent probability of particular lower explanations relative to higher ones. Metacognition probably is too demanding for the tiny brains of fruit flies, for instance. However, the Conservative Canon enshrines a completely general preference for lower over higher. That it may *sometimes* be reasonable to favor lower over higher is not sufficient to justify such a blanket bias. Indeed, the fact that the antecedent probability of having particular psychological capacities *is* different for different species constitutes reason to reject the Conservative Canon, since the principle does not take that into account.

Aside from such justificatory problems, the blanket bias towards lower explanations enshrined in the Conservative Canon is also demonstrably pernicious in terms of its actual and likely effects on the conduct of research (see also Mikhalevich this volume). Consider Gallistel's claims again. Associative learning hypotheses are often the first port of call for skeptics about sophisticated cognition in animals. Consequently, experimentalists (quite rightly) try to devise experiments capable of ruling out such hypotheses. However, one of the effects of associative learning occupying the position of being the default hypothesis is that comparative psychologists have generally adopted a

distinctly uncritical attitude toward the process, assuming it to be a pervasive domain-general process, capable of explaining a very wide range of seemingly complex behaviors, but which requires little cognitive sophistication. However, if Gallistel is right, this seems to have largely just been taken for granted. That is what happens when certain types of hypothesis win by default: the nature and actual explanatory power of such hypotheses receives very little critical scrutiny.

Moreover, consider the effects of *all* researchers actually abiding by the Conservative Canon—i.e., *accepting* or at least *preferring* the lowest explanation consistent with the available data in all possible areas of inquiry. This could be potentially extremely damaging, insofar as it would discourage researchers from taking seriously the idea that particular species *may* possess cognitive capacities more sophisticated than deemed necessary by an application of the Canon to the existing data. Discoveries in science often come when scientists actively pursue bold and provocative hypotheses that can't initially be demonstrated empirically. Von Frisch's famous work on the honeybee dance language provides an important example of this (Fitzpatrick 2008). The idea that honey bees actively communicate information to each other about the location and quality of foraging sites was not something that von Frisch could empirically establish until after decades of patient investigation, and there certainly were less cognitively sophisticated explanations for bee foraging behavior that didn't involve communication available throughout this period—for instance, that bees merely follow the scent given off by returning foragers. Indeed, I suspect that this remarkable communication system might not have been discovered had von Frisch abided by the

Conservative Canon and accepted the lowest explanation that was available at the beginning of his investigations.

The Restraining Canon

Given these problems with the Conservative Canon, the Restraining Canon seems much more appropriate. This Canon does not state that lower explanations automatically win when they are available. Rather, it urges that we *withhold* endorsement from a higher explanation when a lower one can be offered. Initially, this seems thoroughly reasonable, and I suspect it is what many apparent advocates of the Conservative Canon really have in mind. Nonetheless, the Restraining Canon is highly problematic.

The first problem concerns the conditions under which higher explanations *can* be accepted. The strongest version of the principle would require that it be *impossible* to explain the relevant behavior in lower terms. This is clearly too strong. Scientists are almost never in a position to conclusively rule out all alternative explanations, no matter how well a series of experiments has been designed. The most one can hope for is to render alternative hypotheses implausible relative to the candidate hypothesis. Deciding between rival explanations for empirical data—especially behavioral data—is typically a matter of determining the balance of plausibility, rather than a strict process of elimination. Nonetheless, there do seem to some researchers that employ the Canon in such a strong fashion, demanding that advocates of higher processes produce data that cannot *possibly* be interpreted in any other way (e.g., Povinelli and Vonk 2003). Such demands are both excessive and distract from what is really at stake, which is weighing the overall balance of evidence (Fitzpatrick 2009; Andrews 2015).

There is a more fundamental problem with the Restraining Canon, however. The core idea is that higher explanations ought to face the burden proof in order to counteract our supposed bias toward cognitively sophisticated accounts of animal behavior. According to one recent defence of the Canon:

Adherence to the canon forces one to dig deeper when designing experiments and devising theories, and, in doing so, Morgan's canon pressures comparative psychologists to produce better science. (Karin D'Arcy 2005: 197)

But why should comparative psychologists be “pressured” in only one direction? Karin D'Arcy writes as if only higher explanations can be endorsed erroneously, focusing on the tendency to project human folk psychology onto other creatures. Yet, comparative psychologists can fall prey to all sorts of inferential biases, not all of which lead to attributions of higher processes. The history of twentieth century comparative psychology demonstrates that researchers are just as capable of accepting lower explanations without sufficient evidence. It was once widely taken for granted that all animal behavior can be explained in terms of classical or operant conditioning, not because this enjoyed direct empirical support, because of a compulsion, motivated by spurious concerns about “anthropomorphism”, to adopt the least cognitively sophisticated account of animal behavior one could imagine. These scientists *also* needed to “dig deeper” and “produce better science.”

If the problem Karin D'Arcy and other advocates of the Canon are concerned with is researchers endorsing explanations of animal behavior without due attention being paid

to alternatives, we can see that the asymmetry built into the Restraining Canon is quite inappropriate as a response. This is as much a problem with respect to lower explanations as higher ones; yet, the Restraining Canon places the focus only on higher explanations. Instead, the following sort of principle, which I call *Evidentialism*, would much better serve the field:

In no case should we endorse an explanation of animal behavior in terms of cognitive process X on the basis of the available evidence if that evidence gives us no reason to prefer it to an alternative explanation in terms of a different cognitive process Y—whether this be lower *or* higher on the ‘psychological scale’. (Fitzpatrick 2008: 242)

This principle urges us to *always* be mindful of alternative explanations, be these cognitively more or less sophisticated than the one that is being advanced, and only endorse a given explanation when one is able to show that that explanation, whatever it is, is better supported by the available evidence than the alternatives—“evidence,” here needn’t just be behavioral evidence, but may include any information relevant to assessing the evidential status of a given psychological hypothesis.

I don’t deny that advocates of higher processes sometimes fail to pay adequate attention to lower-level alternatives when accounting for the results of particular experiments. In this respect, researchers *do* need to “dig deep” and try to design experiments that can provide differential evidence for higher processes, if they are present, but we don’t need the Restraining Canon to remind them to do that. As Sober

(2005: 97) has put it, the only “prophylactic” we need for the kinds of inferential errors and biases that Morgan’s Canon has been thought to control for is “empiricism.” Crucially, Evidentialism captures whatever genuine methodological benefits can be brought with the Restraining Canon, but doesn’t enshrine the problematic asymmetry that is built into that principle, which places the focus exclusively on higher explanations. That asymmetry is both completely unjustified by the genuine concerns highlighted by advocates of the Canon and *pernicious*, in so far as it distracts away from parallel concerns about systematically underestimating the cognitive capacities of animals.

The Cautionary Canon

This leaves us with the Cautionary Canon. On this interpretation, the Canon shouldn’t be seen as offering any specific methodological advice; rather, it serves to remind students of the chequered history of animal cognition research, and urges them not to make the same mistakes as their forebears. The problems I have identified with the other Canons might then be seen as a product of taking the Canon out of this pedagogical context.

This is fine, as far as it goes. To some extent, the Canon has been useful as a pedagogical instrument, and Morgan should continue to be remembered as a pivotal figure in the history of comparative psychology for pointing out the errors of much early work in the field—though the tendency of modern researchers to focus exclusively on the Canon has obscured many of his key contributions (Fitzpatrick and Goodrich forthcoming). However, the asymmetric focus on attributions of sophisticated cognitive capacities to animals remains problematic, and the general absence of parallel cautionary exhortations about how researchers can go astray when it comes to denying the presence

of sophisticated cognitive capacities in animals has, in my view, been extremely damaging to the conduct of research in comparative psychology. Hence, the key message should really be what one finds in Evidentialism. It is this, not Morgan's Canon, that should be pounded into the heads of future generations of researchers.

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ⁱ Some critics have seen the very notion of a psychological scale as problematic, particularly if it is anchored (as it was in Morgan’s case) to the notion of an *evolutionary* scale, where “higher” processes are taken to represent a higher stage of evolutionary development. I will not consider such concerns here, except to say that I think that modern interpretations of the Canon can be separated from an evolutionary scale, and that the notion of cognitive sophistication I have described is best understood in functional terms (Fitzpatrick 2008).