Evolutionary debunking arguments in three domains: Fact, value, and religion[1]

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Abstract

Ever since Darwin people have worried about the sceptical implications of evolution. If our minds are products of evolution like those of other animals, why suppose that the beliefs they produce are true, rather than merely useful? We consider this problem for beliefs in three different domains: religion, morality, and commonsense and scientific claims about matters of empirical fact. We identify replies to evolutionary scepticism that work in some domains but not in others. One reply is that evolution *can* be expected to design systems that produce true beliefs in some domain. This reply works for commonsense beliefs and can be extended to scientific beliefs. But it does not work for moral or religious beliefs. An alternative reply which has been used defend moral beliefs is that their truth does not consist in their tracking some external state of affairs. Whether or not it is successful in the case of moral beliefs, this reply is less plausible for religious beliefs. So religious beliefs emerge as particularly vulnerable to evolutionary debunking.

1. Evolutionary debunking arguments

Religion and morality are traditional targets for evolutionary debunking arguments. When used to target religious beliefs these are part of a larger tradition of naturalistic debunking arguments that can be traced back at least to David Hume (1956 [1757]). Evolutionary debunking arguments against moral beliefs have been influential since Darwin first gave an evolutionary account of the origin of the moral sense, and remain important in contemporary moral philosophy (e.g. Joyce 2006). Probably the most widely-discussed evolutionary debunking argument in contemporary philosophy is that of Alvin Plantinga, who argues that if the mind has evolved by natural selection and without a creator God, then we have no reason to suppose that any of our beliefs are true (Plantinga 1991; Plantinga 1993).[i] So evolutionary scepticism can be directed at science and commonsense, as well as its more traditional targets!

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Guy Kahane (In Press) has outlined the general form of evolutionary debunking arguments:

> *Causal premise.* S's belief that p is explained by X
>
> *Epistemic premise.* X is an off-track process
>
> *Therefore,* S's belief that p is unjustified

An 'off-track' process is one that does not track truth: it produces beliefs in a manner that is insensitive to the truth those beliefs.

In the case of commonsense beliefs, we will present the most straightforward reply to such an argument, and deny the epistemic premise of Kahane's schema. Evolution by natural selection is not an off-track process with respect to commonsense and favours organisms that form true commonsense beliefs. The argument that evolution does not track truth rests on a misunderstanding of natural selection. We explain this misunderstanding, and clarify the sense in which evolution does track truth. We then argue that if commonsense beliefs survive the attempted debunking, so also do scientific beliefs. In the case of moral beliefs we consider a second way to deny the epistemic premises in Kahane's schema, namely by giving a deflationary account of truth-claims in the relevant domain. Kahane and others have explored this response to evolutionary scepticism about morality. We consider it as a response to evolutionary scepticism about religion, and conclude that it is unlikely to succeed in that domain.

2. Truth and pragmatic success: The Milvian bridge

We call an argument which links true belief to pragmatic success a 'Milvian bridge'. The battle of the Milvian Bridge in 312AD led to the establishment of Christianity as the state religion of the Roman Empire. Constantine's victory was traditionally ascribed to the fact that his Christian beliefs were true, whilst the beliefs of his pagan opponents were false. The kind of pragmatic success we are concerned with, however, is not military, but evolutionary. To defeat evolutionary scepticism, true belief must be linked to evolutionary success in such a way that selection will favour organisms which have true beliefs. It would be unreasonable to require that evolution produce organisms *all* of whose beliefs are true. We know that people and animals frequently form false beliefs. It would be equally unreasonable to require that evolution produce organisms whose beliefs are formulated in an ideal conceptual scheme. This would imply that only God or an ideal epistemic agent speaking at the 'end of inquiry' could have true beliefs. A reasonable formulation of the Milvian bridge principle would be something like this:

> *Milvian Bridge*: X facts are related to the evolutionary success of X beliefs in such a way that it is reasonable to accept and act on X beliefs produced by our evolved cognitive faculties

No Milvian bridge links true religious beliefs to evolutionary success. None of the leading contemporary accounts of the evolution of religious belief make any reference to the truth or falsity of those beliefs when explaining their effects on reproductive fitness (see Section Six). Conversely, no serious contemporary theologian supposes that the relative truth of two religions can be decided by counting how many children their adherents successfully raise.

We will argue, however, that there is a Milvian bridge connecting true commonsense beliefs to evolutionary success. By 'commonsense' beliefs we mean those which guide mundane action, and whose subjective certainty was famously appealed to by G.E Moore (1925). Moore's examples

included the existence of his body, and of other human bodies and inanimate bodies, all arranged in space and time, as well as the fact that those other human bodies knew similar things. On topics like this we, and other animals, have been selected to track truth.

3. Evolutionary skepticism and commonsense

It has become quite common for philosophers and psychologists to argue that argued that evolution does not produce cognitive systems which track truth.[ii] The argument for this conclusion has two steps. The first is to note that natural selection will favor cognitive adaptations which produce fitness maximizing beliefs irrespective of the truth of those beliefs. Stephen Stich, for example, begins by observing that, "…natural selection does not care about truth; it cares only about reproductive success." (Stich 1990) The second step is to observe that selection often seems to have favoured unreliable cognitive systems which generate errors over more reliable systems that would eliminate those errors. The literature on heuristics and biases in human cognition is a rich source of examples (Gigerenzer and Todd 1999; Gigerenzer and Selten 2001). Human beings perform very badly on apparently simple reasoning tasks, committing a range of fallacies. These are so widespread and so systematic that they are overwhelmingly likely to be part of healthy mental functioning. So it seems that humans being form beliefs using simple but unreliable heuristics rather than more reliable but more complex patterns of reasoning. As a result, it is predictable that they will form many false beliefs. There also seem to be positive biases towards false belief. In a recent review, Ryan McKay and Daniel Dennett conclude that the most plausible case of actual selection for such positive biases is the well-documented fact that human beings have unrealistically positive views of themselves and of their prospects in life.(McKay and Dennett 2009).

Combining these two steps we get the following general argument:

1. Evolution does not select for truth-tracking unless truth-tracking coincides with fitness

2. The fittest belief forming mechanisms are not always those designed to produce the largest proportion of true beliefs, or the most accurate beliefs.

3. Therefore, we should not have a general expectation that evolved organisms will track truth

This argument does not demonstrate that all or most beliefs are actually false. But it does apparently undermine any *a priori* assumption that evolved cognitive systems will produce beliefs that are for the most part true or approximately true. This is enough to provide the starting point for an evolutionary debunking argument of the kind suggested by Plantinga: If we believe that our minds are the products of natural selection, then we have to take seriously the possibility that the beliefs they produce are not true, but merely useful.

In what follows we will argue that this kind of argument is confused, and that the fundamental pressure driving the evolution of cognition is truth-tracking. The first step in the argument, the idea that fitness-tracking is an *alternative* to truth-tracking is a misunderstanding. When the relation between the two is properly formulated it becomes clear that the various circumstances in which selection favours unreliable cognitive mechanisms all involve obtaining as much truth as possible given the constraints. An unconstrainedly optimal cognitive system would have every true belief relevant to its activities and no false beliefs, but this is simply impossible and therefore not an appropriate definition of an evolutionary optimum for truth tracking. Once this confusion is cleared up, the cases in which evolution has apparently not selected for truth-tracking appear in a very different light. They are either cases of selection for an optimum state of truth-tracking given

inescapable constraints on optimization, or cases of a secondary adaptation which could only have evolved against a general background of selection for truth-tracking. Human failures to track truth are consistent with selection for truth-tracking in just the same way that failures by rabbits to escape predators are consistent with selection in rabbits for escaping predators.

Truth-tracking and fitness-tracking are not alternatives

It is an error to contrast truth-tracking and fitness-tracking because this treats complementary explanations at different levels of analysis as if they were rival explanations at the same level of analysis (Goode and Griffiths 1995). Consider the following example: Most frogs use vocalizations to signal to conspecifics, but some use a visual display known as 'leg-waving'. They hold up one back leg, spread their toes, and wave their foot about. Sometimes the webbing between the toes is brightly coloured. Leg waving is quiet. It can also be detected in noisy environments. For brevity, let us call that second feature 'noiseproof'. Then we can ask which of these effects was the 'target of selection'? Did selection favour a quiet signal, perhaps because it does not attract predators, or did it favour a noiseproof signal? This is an entirely straightforward scientific question which asks whether either of these properties figures in a selective explanation of the trait (if both properties play a role in the explanation of the success of the trait, then their effects are combined to explain the total effect of selection). Because leg-waving has evolved independently several times in frogs, and its evolution is associated with species that live in noisy, fast-running streams, being noiseproof was probably the target of selection (Hödl and Amézquita 2001). In Elliot Sober's terminology there was selection *for* being noiseproof but only selection *of* being quiet (Sober 1984). This conclusion presupposes that the two selection explanations are potential alternatives to one another. Selection for being noiseproof could have led to the evolution of leg-waving, or selection for being quiet could have done it, or they could both have done it. These are three, distinct empirical hypotheses. But it makes no sense to ask if leg-waving was selected for being noiseproof or for enhancing fitness, since these are not distinct empirical hypotheses. Being noiseproof is not an alternative to enhancing fitness, it is a means to the end of enhancing fitness. There are other means to the same end, and these are potential alternatives, but it makes no sense to regard the end itself as an alternative means to achieve that end!

'Fitness-tracking' is not an alternative to 'truth-tracking' because truth-tracking is a property at a lower level of explanation. Truth-tracking is a measure of a certain kind of ecological interaction with the environment. It is akin to 'foraging efficiency' or 'respiratory efficiency'. An organism can succeed because it is better than its rivals at tracking truth just as it can succeed because it is better at foraging or because it has a more efficient respiratory system. It makes sense to ask whether a trait is an adaptation for respiration, or for foraging, or for something else. It makes no sense to ask if a trait is an adaptation 'for fitness', since that is simply to repeat the definition of an adaptation – a trait that evolved because it enhanced fitness.

Why evolution selects for truth-tracking

If our evolved cognitive mechanisms were not selected for tracking truth, then either they are not adaptations, or they were selected for some other, substantial ecological benefit. The hypothesis that human cognitive mechanisms are not adaptations is highly implausible because they are so expensive. The human brain makes up about 2% of body mass, but accounts for about 20% of oxygen consumption. Beliefs, true or false, come at a high price. If there were no adaptive advantages to having a mass of expensive neural tissue, then there would be strong selection against it. So our evolved cognitive mechanisms are probably adaptations. If they are not adaptations for truth-tracking then they must be adaptations for something else. Once the vacuous suggestion that they are 'adaptations for fitness' has been dismissed it is hard to see what the basic evolutionary function of cognition could be other than tracking truth. The fact that the fittest belief

forming mechanisms are not always those designed to produce the largest proportion of true beliefs can be explained perfectly well once we recognize that, like all evolutionary processes, truth-tracking operates under constraints.

The most fundamental constraint is cost. Organisms have limited resources and truth-tracking is not the only thing they need to do to survive. Resources allocated to forming true beliefs are resources unavailable for making sperm or eggs, or fighting off the effects of ageing by repairing damaged tissues. If the fitness benefits of allocating a unit of energy to one of those activities exceeds the fitness benefits of allocating that energy to improving the accuracy of beliefs, then that is where it will be allocated. The scientists whose work is usually cited to demonstrate how badly human beings track truth have long argued that failures of rationality can be understood as heuristics which sacrifice being right all the time for being right most of the time at a greatly reduced cost (Gigerenzer and Todd 1999; Gigerenzer and Selten 2001). A heuristic does not guarantee a correct answer every time, but it is right often enough that there is no point in adopting a more reliable but more costly method. A heuristic is not a method for making mistakes. While our use of simple heuristics does show that truth is being traded off against fitness, what this means is that truth-tracking, one component of fitness, is being traded off against other components such as sperm production. So even 'bounded rationality' is an adaptation for tracking truth.

Another constraint arises from the intrinsic logical structure of many cognitive tasks. It is often impossible to form true beliefs without also forming some false beliefs. For example, whenever an organism needs to make a decision under uncertainty, then it is logically impossible to reduce the risk of Type One errors (accepting something that is not true) without *increasing* the risk of Type Two errors (rejecting something that is true) and vice-versa. Organisms often need to act before conclusive information is available, so the evolutionary task they face is that of achieving an optimal trade-off between these two types of error. In evolutionary psychology this idea is known as 'error management theory' and is the subject of a small scientific literature (Haselton 2007). But the idea has very general application, a point which has been clearly made by Peter Godfrey-Smith (Godfrey-Smith 1991). An optimally designed cognitive mechanism will represent the world in such a way that the actions resulting from those beliefs have the highest expected value. From this observation it is easy to fall into the fallacy identified above and conclude that optimal design tracks fitness *instead of truth*. The way to avoid this fallacy is not to rest content with the fact that a given set of beliefs has the highest expected value, but to ask *why* they have that expected value. The answer is the fit or lack of fit between those beliefs and how the world is. If an animal acts as if the world is a certain way when the world is that way, those actions will be successful. If it acts as if the world is a certain way and it is not, then those action will be frustrated by the way the world is, and thus constitute a waste of precious resources. Hence, increases in fitness are explained by successful truth-tracking and reductions in fitness by failures in truth-tracking. Truth-tracking is the means by which fitness is achieved.

In the light of the two unavoidable constraints just identified – cost constraints and intrinsic task constraints – the evolutionary optimum of 'truth tracking' should be defined as obtaining as much truth and as little error as possible, given the intrinsic trade-offs between them, with the balance determined by the value of the truths and the cost of the errors, and with possible solutions constrained by the cost of cognitive resources. This can be put in the form of a slogan:

> Organisms track truth optimally if they obtain as much relevant truth as they can afford, and tolerate no more error that is needed to obtain it.

With this definition of truth-tracking it is very plausible that commonsense beliefs are produced by cognitive adaptations that track truth.

4. Evolutionary skepticism and science

Commonsense beliefs are couched in commonsense concepts, not the concepts of our best current science. Moore was certain that he had two hands, not that he had two instances of the distal portion of the pentadactyl limb. Our commonsense concepts are themselves an evolutionary inheritance, and we know that they differ systematically from those of other animals. So it is plausible that if our evolution had followed a different course, we would have a different conceptual scheme. It is possible to see in this observation grounds for another kind of evolutionary skepticism.

Whatever ontological authority may attach to the concepts and categories of science, the commonsense way in which humans see the world has no more or less ontological authority than the ways in which other animals see the world. The physicist Arthur Eddington famously contrasted the commonsense understanding of his writing table as a solid object with the scientific understanding of it as an area of mostly empty space of which the best that can be said is that the probability of his elbow sinking through it was small enough to be neglected for the purpose of writing his lecture (Eddington 1930). One response to facts of this kind is to suppose that the belief that grass is green or that tables are solid are merely illusions foisted on us by our selfish genes, and in reality there are no green or solid objects, only electromagnetic radiation and quantum interactions.[iii] But there is no reason to abandon the world of commonsense, as long as we are prepared to accept that we are not the only animal whose evolved perceptual and conceptual schemes can stand alongside the measurement and conceptual schemes of science, and be explained by it. There really are red things and green things, but there are also things which have ultra-violet colours that we cannot detect but other animals can. There are many ways of classifying the world which are not purely arbitrary and it is the fact that these classifications are constrained by reality explains why they have some degree of pragmatic utility.[iv]

One of the triumphs of science is that it allows us to move beyond our evolved conceptual scheme to more encompassing conceptual schemes, in light of which we can determine and explain the limits of our original, evolved conceptual scheme and those of other species. But this can itself give rise to yet another basis for evolutionary skepticism. If human beings can supplement their evolved conceptual scheme with new concepts, should we have confidence that our cognitive faculties can still track truth in this new, enriched conceptual framework? Our cognitive faculties were selected because they tracked truth in the human *Umwelt*[v], not for their ability to do calculus, or to track truth about superpositions of particles at the quantum level. There is no *direct* Milvian bridge linking these particular cognitive processes to evolutionary success.

Instead, there is an *indirect* Milvian bridge. Given the Milvian bridge connecting commonsense to pragmatic success, we can justify the methods by which we arrive at our scientific beliefs. The reasons we have to think that our scientific conclusions are correct and that the methods we use to reach them are reliable are simply the data and arguments which scientists give for their conclusions, and for their methodological innovations. Ultimately, these have to stand up to the same commonsense scrutiny as any other addition to our beliefs. Thus, if evolution does not undermine our trust in our cognitive faculties, neither should it undermine our trust in our ability to use those faculties to debug themselves – to identify their own limitations, as in perceptual illusions or common errors in intuitive reasoning. Nor should it undermine our confidence in adopting new concepts and methods which have not themselves been shaped by the evolution of the mind, but whose introduction can be justified using our evolved cognitive faculties.

5. Evolutionary skepticism and ethics

Since the late nineteenth century most moral philosophers have rejected attempts to derive moral principles from evolution. But most of these philosophers have not supposed that evolution actively undermines our moral principles. But there is an evolutionary debunking argument which has precisely this implication. The argument suggests is that evolution of the moral sense is an 'off-track' process because it has no intrinsic tendency to produce a moral sense that tracks moral truths. This idea can be found in Darwin's own discussion of the evolution of morality:

> "In the same manner as various animals have some sense of beauty, though they admire widely different objects, so they might have a sense of right and wrong, though led by it to follow widely different lines of conduct. If, for instance, to take an extreme case, men were reared under precisely the same conditions as hive-bees, there can hardly be a doubt that our unmarried females would, like the worker-bees, think it a sacred duty to kill their brothers, and mothers would strive to kill their fertile daughters; and no one would think of interfering."(Darwin 1981 [1871])[vi]

Darwin argues that if our ecology had been different, then we would judge different things to be right and wrong, just as different species of animals judge different things to be beautiful. Animals are aesthetically attracted to things to which it is fitness-enhancing for them to be attracted. Just so, Darwin argues, they will approve whatever actions which it is fitness-enhancing for them to approve. This would seem to imply either that evolution is an off-track process with respect to evaluative truth, or that evaluative truths are truths about what maximises reproductive fitness. If this is right, then the only alternative to moral scepticism would, indeed, be evolutionary ethics.[vii]

There is no Milvian bridge connecting moral truth to pragmatic success and thus defending morality from evolutionary skepticism, because contemporary evolutionary explanations of morality, just like Darwin's explanation, do not involve any adaptive advantages produced by detecting and acting in accordance with objective moral facts.[viii] But Kahane notes that the assumption that moral truths correspond to objective moral facts is one that is questioned by many moral philosophers for independent reasons. The evolutionary skeptical argument against ethics would be better stated as follows:

1. *Causal premise*. Our evolutionary history explains why we have the evaluative beliefs we have.

2. *Epistemic premise*. Evolution is not a truth-tracking process with respect to evaluative truth.

3. *Metaethical assumption*. Objectivism (moral realism) is the correct account of evaluative discourse

C. *Evaluative scepticism*. None of our evaluative beliefs is justified.

If we deny the assumption that evaluative beliefs denote moral realities then conclusion fails to follow. Non-cognitivist ethical theories, according to which the function of ethical judgments is not to express facts but to express allegiance to a norm, remain viable in moral philosophy (van Roojen 2009). Moreover, it has been argued that some forms of cognitivism also evade the argument because their account of moral truths does not involve the existence of moral facts which need to be 'tracked' in the manner envisaged by the argument (Harms 2000; Carruthers and James 2008). So

the evolutionary debunking argument is best conceived as an argument against strong forms of moral realism, rather than simply against moral truth.

The case of ethics shows that there are two responses to an evolutionary debunking argument. The first is to build a Milvian bridge, and argue that evolution will select cognitive faculties that track truth in a domain. The second is to argue that 'truth' in a certain domain is not a matter of tracking some external state of affairs, so that the question of whether evolution is an off-track process in that domain does not arise. In the next section we ask if either of these responses is available when evolutionary skepticism is applied to religious beliefs.

6. Evolutionary skepticism and religion

No Milvian bridge is available for religious beliefs, because none of the leading accounts of the evolution of religious belief makes any reference to the truth or falsity of those beliefs when explaining their effects on reproductive fitness. This is true both of evolutionary theories which explain religion as a side-effect of other adaptations, and those which explain it as an adaptation in its own right. For example, on the 'costly commitment' account of religion, belief in God is an adaptation in its own right. This is because it is fitness-enhancing to advertise in a clear and hard to fake manner your membership of your community, so that you can access its support and protection when you need it (Sosis and Alcorta 2003; Bulbulia 2004). On this theory, Constantine's adoption of a Christian battle standard at the Milvian bridge was a signal to his predominantly Christian troops. His victory was due to social solidarity rather than divine intervention.

David Sloan Wilson's account shows the same lack of concern with the specific content of religious beliefs; arguing that religion evolved through multi-level selection, driven by the benefits which social cohesion and prosocial behavior provide at the level of the group (Wilson 2002). Nothing in this explanation discriminates between true and false religious beliefs. Constantine's victory occurred because his more predominantly Christian army approximated a superorganism like an ant colony slightly more closely that did the more predominantly pagan army of Maxentius, not because Christianity was true and paganism false.

Theories which explain the evolution of religion as a side-effect are equally undiscriminating. The idea that religious belief is to a large extent the result of mental adaptations for agency detection has been endorsed by several leading evolutionary theorists of religion (Guthrie 1993; Boyer 2001; Atran 2002; Barrett 2005). Broadly, these theorists suggest that there are specialized mental mechanisms for the detection of agency behind significant events. These have evolved because the detection of agency – 'who did that and why?' – has been a critical task facing human beings throughout their evolution. These mechanisms are 'hyperactive', leading us to attribute natural events to a hidden agent or agents.

So none of the contemporary evolutionary explanations of religious belief hypothesizes that those beliefs are produced by a mechanism that tracks truth. This may seem puzzling, given that we have argued above that the evolution of cognition is driven by truth-tracking. But the contradiction is only apparent. The side-effect explanation is straightforwardly consistent with the models we have sketched above. If the 'hyperactive agency detection device' theory is correct, then people believe in supernatural agents which do not exist for the same reason that birds sometimes mistake harmless birds passing overhead for raptors. These beliefs are Type One errors and they are the price of avoiding more costly Type Two errors. The adaptive explanations of religion work somewhat differently. They identify a way in which a sophisticated cognitive system could evolve a positively selected departure from truth-tracking. But this explanation presumes that the

underlying cognitive system has already evolved, with truth-tracking as its fundamental aim. So a single, integrated account of the evolution of cognition can argue that the basic evolutionary dynamic that produced cognition is truth-tracking, but that certain, specialized classes of beliefs evolved as secondary adaptations for promoting social solidarity. Religious beliefs which fail to track truth are necessarily a secondary adaptation against a background of beliefs which track truth for the same reason that colour patterns in harmless insects which mimic those of poisonous insects necessarily only evolve when poisonous insects are using those colour patterns.

If a Milvian bridge cannot be constructed linking the truth of religious beliefs to evolutionary success, then the alternative is to argue that the truth of religious beliefs is not a matter of their tracking some state of affairs in the world. Several academic theologians have attempted to purge religion of its claims about the supernatural, one of the best known attempts being the 'Sea of Faith' movement headed by the British theologian Don Cupitt (2008). Sloan Wilson has also suggested that the theological beliefs associated with a religious tradition may be more or less epiphenomenal to its functioning as a social institution and that they may be perceived by adherents as mere 'preacher talk' (Wilson 2007, 265). However, liberal theologians of this stripe have usually been thought heretical by ordinary believers. Few religious believers can be persuaded to accept a non-cognitivist or a fictionalist theology.

Religious beliefs are thus peculiarly vulnerable to EDAs. The truth of religious beliefs does seem to be a matter of tracking some external state of affairs, so that the question of whether evolution is an off-track process with respect to religious beliefs cannot be sidestepped. But the leading evolutionary explanations of these beliefs all suggest that they are produced by cognitive adaptations which do not track supernatural truths.

6. Conclusion

Evolutionary debunking arguments suggest that the evolutionary origins of our cognitive faculties should undermine our confidence in the beliefs which those faculties produce. We argue that the force of this skeptical argument depends on the specific class of beliefs, and these arguments have lno force against commonsense, factual beliefs. In this domain natural selection will design cognitive faculties which track truth by obtaining as much relevant truth as the organism can afford, and which tolerate no more error than needed to obtain it. This is enough to build what we have called a 'Milvian Bridge': The commonsense facts are related to the evolutionary success of commonsense beliefs in such a way that it is reasonable to accept and act on commonsense beliefs produced by our evolved cognitive faculties.

We have further argued that evolutionary scepticism about scientific beliefs is unsuccessful because there are commonsense justifications of the processes by which we arrive at our scientific beliefs.

Evolutionary debunking arguments have more force for ethical beliefs. Evolutionary accounts of the origins of moral intuitions may undermine confidence in those intuitions if moral beliefs are given a strongly realist interpretation. But non-cognitivist moral philosophers, and perhaps some less ambitious moral realists, are unaffected by the argument since they deny that moral beliefs need to track moral facts in order to be true.

Finally, religious beliefs emerge as particularly vulnerable to EDAs, since neither counterargument seems to work there. Current evolutionary theory really does support the view that human beings would have religious beliefs even if all religious beliefs were uniformly false. But debunking is not disproving. If there are independent reasons for religious belief, their cogency is not removed by

the fact that religious beliefs have evolutionary explanations. As Darwin wrote, “Let each man hope & believe what he can.”[ix]

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[i] Plantinga uses his evolutionary scepticism to attack the view that there is no creator God. For an introduction to the extensive philosophical literature on Plantinga's argument see Beilby, J. K., Ed. (2002). Naturalism Defeated?: Essays on Plantinga's Evolutionary Argument Against Naturalism. Ithaca, NY, Cornell University Press.

[ii] For a good introduction to this literature, see Downes, S. M. (2000). "Truth, selection and scientific inquiry." Biology and Philosophy **15**(3): 425-442. For a critical survey of scenarios in which evolution might favour false beliefs, see McKay, R. T. and D. C. Dennett (2009). "The evolution of misbelief." Behavioral and Brain Sciences **32**: 493-561.

[iii] For a recent instance of this reasoning, see Johnston, V. S. (1999). Why we Feel: The new science of human emotions. New York, Basic Books.

[iv] For an extended defense of 'promiscuous realism' see Dupré, J. (1993). The Disorder of Things: Metaphysical Foundations of the Disunity of Science. Cambridge, Mass., Harvard University Press.

[v] The world represented in the perceptual and conceptual scheme of a particular species. See Uexküll, J. v. (1957). A Stroll Through the Worlds of Animals and Men: A Picture Book of Invisible Worlds. Instinctive Behavior: The Development of a Modern Concept. S. C. H. New York, International Universities Press, Inc.**:** 5-80.

[vi] Darwin, C. R. (1981 [1871]). The Descent of Man and Selection in Relation to Sex. Princeton, NJ, Princeton University Press.

[vii] For a modern version of this argument, see Ruse, M. and E. O. Wilson (1986). "Moral Philosophy as Applied Science." Philosophy **61**(236): 173-192.

[viii] See, for example, Ridley, M. (1997). The Origins of Virtue. London, Viking, Sober, E. and D. S. Wilson (1998). Unto Others: The Evolution and Psychology of Unselfish Behavior. Cambridge, M.A, Harvard University Press.

[ix] Darwin to A. Gray, May 22nd 1860. Darwin correspondence project #2814