ON THE POSSIBLE EVOLUTIONARY JUSTIFICATION OF OUR EPISTEMIC CAPACITIES

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ABSTRACT. The Darwinian justification of the most basic methodological presuppositions of science is criticized; it is argued that this justificatory effort fails because it is viciously circular and because it confuses a causal or historical explanation with justification. Furthermore, even if our cognitive intuitions or dispositions have been selected by evolution, it doesn't follow that these methodological intuitions are reliable, since survival doesn't require their reliability, and this in turn implies that a belief in the Darwinian perspective itself could be false.

KEY WORDS. Evolutionary epistemology, cognitive faculties, evolutionary justification, viciously circular justification, adapatative architecture, innate capacities.

> Darwin's theory has no more to do with philosophy than any other hypothesis in natural science.
>
> L. Wittgenstein

> What is wrong with evolutionary epistemology is not that the scientific facts are wrong, but that they don't answer any of the philosophical questions.
>
> H. Putnam

INTRODUCTION

Some naturalist philosophers have claimed that,

> the methods of science are rooted in selective necessity ***T****he nature and development of science is constrained and informed by the biologically channeled modes of thinking imposed on us by evolution*—a consequence of the reproductive struggles faced by humans today, and even more a consequence of those struggles faced by humans in the past.
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> In other words, in order to understand why science is as it is—why laws, why predictions, why falsifiability, why consiliences—we need to look at the principles of scientific reasoning or methodology. What I argue is that these

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> principles have their being and *only justification in their Darwinian value, that is in their adaptive worth to us humans—or, at least, to our proto-human ancestors. In short, I argue that the principles which guide and mould science are rooted in our biology (*M. Ruse, 1986, pp. 149, 155. Emphasis added).

I will examine in this essay whether it is possible to justify as reliable [1] our cognitive capacities from an evolutionary perspective, I will argue that an evolutionary justification is not possible without vicious circularity, and I will also argue that what evolution theory can instead hope to do is to explain the origin of our intellectual faculties. Whether evolution can provide a genetic explanation of the reliability of our cognitive capacities, is also debatable, since there are reasons to doubt the rationality [2] of a belief in an evolutionary explanation of our intellectual powers.

We have several cognitive faculties or intellectual capacities: inferential capacities such as inductive and deductive capacities, and 'source' capacities such as memory, perception and intuition [3]. We consider these capacities of ours, when functioning properly [4] and in an adequate environment, as reliable either as transmitters, or as expanders and sources of truth. The problem now arises on how to justify this belief in the reliability of our cognitive faculties. The quest for the justification of the methods, or criteria, of science is not an idle one, as shown by the fact that the methods of science are nowadays challenged by alternative cognitive standards, for example, those of creationism. Moreover, creationism's alternative standards deny much of the framework of accepted scientific knowledge, hence it is important to try justifing as correct the cognitive standards of science.

I will analize in what follows the influential answer to this problem provided by "evolutionary epistemology", a constellation of doctrines assembled in the current literature under such name. This coalescence can be analyzed as consisting of two related but different families (cf., M. Bradie). One family looks for analogies between the evolution of life and that of the history of ideas, in particular that of the history of our changing science. The doctrines in this first subset are mainly interested in understanding the growth of knowledge, on an individual or on a species basis; for this they invoke analogies to natural selection. The other subset (EE for short), the one to be discussed here, intends to understand, explain and *justify* our basic mental cognitive abilities and innate methodological propensities as *only* [5] the result of evolutionary mechanisms as *nowadays* understood. The focus is now on the understanding of the development of these innate methods of thesis substantiation amongst the organisms in a lineage rather than on that of the evolution of the factual theses themselves.

EE claims that biological evolution has predisposed us to think in a way that is constrained by a certain fixed adaptive mental architecture, or at

any rate, the claim is that if this mental architecture is not entirely fixed, then it remains changeless for periods of historical magnitude. It is claimed that our most basic cognitive methods are reflections of innate dispositions and the result of natural selection working on the products of some chance events, such as random mutations. Natural selection discards most of these mutations, because they prove to be deleterious to the organism where they appear, but some other are kept because they have survival value, some are kept because they enhance fitness and, as a result, these selected mutations spread through the population.

According to this evolutionary view the emergence of man—including her intellect—is the product of the natural selection of the biologically best adapted or fittest over a span of many generations. These fittest have characteristics or adaptations that enable them to survive and to reproduce better than the unfit. EE claims that reality shapes reason via evolution and that this in turn explains the reliability of our reason when dealing with what is real.

> Reason tells us about reality because reality shapes reason, selecting for what seems "evident" (R. Nozick, p. 112).

In other words, the shaping of our reason by reality could help explain the success of our science and the apparent, or actual, partial harmony of our mind and the world. This evolutionary view is a distant echo of an illustrious earlier position: Plato's theory of *anamnesis*, where the modern cognitive intuition would correspond to the ancient recollection.

The claim is that there is a constant, genetically transmitted, underlying uniformity to human thought; it is maintained that our science is constrained and channeled by our biology.

Put it differently, the thesis of evolutionary epistemology sustains that we have innate capacities and dispositions to understand, discover or learn, let's say, Peano's axioms and some principles of logic (such as the laws of identit, and non-contradiction). It is also claimed that we have an innate methodological propensity to make right inductions (for example, that we have a predilection for projectable predicates) and that we have an inborn fondness for theoretical simplicity and for consilience (that is, for hypotheses with greater explanatory power.)

EE holds that we have these capacities and dispositions *only* because they proved biologically advantageous to our ancestors, tantamaunt, that these capacities and dispositions had a clear survival value to our ancestors in the struggle for existence and therefore were biologically selected and passed on to us.

Now, this selection could have been specific or an unintended by-product of other selected traits; for example, consider the case of pleiotropic genes,

> in which one gene affects two or more distinct traits or systems. It will sometimes be the case that a gene has positive effects in one system and negative effects on another The genes of albinism in arctic animals provide a nice example. The white coats these genes produce are obviously adaptive. However, the same genes typically produce serious eye problems, and albino animals generally can't see as well as their colored conspecifics (P. S. Stich, p. 65).

One could then imagine our intellectual capacities to have been linked to some selected positive trait via (a) pleiotropic gene(s) and we could imagine this gene having been selected by virtue of its link to this positive trait. The biologically negative or indifferent intellectual attributes then could have become perpetuated by virtue of their link with the positive trait via the pleiotropic gene. Hence, the most we can really conclude is that our cognitive instincts are not biologically grossly maladaptive to undermine the adaptive value of any positive traits they may be tied to. M. Ruse comments on this that,

> I would still be uncomfortable about supposing that so fundamental an aspect of human nature as our reasoning abilities was entirely a non-adaptive by-product of the evolutionary process. This is simply not the way that evolution works. When you have major features which seem to have adaptive virtues—and if reasoning does not have such virtues, I do not know what would—then you expect to find natural selection has been at work (M. Ruse, 1995, p. 173).

Whatever might be the case, primitive hominids, which by some accident ended with some cognitive capacities and intellectual preferences—or so the evolutionary story goes—were more successful at reproduction. Then these hominids eventually predominated, or at least were to be well represented, and became our likely ancestors and, consequently, these faculties and preferences are now innate in our descendants and us. These putative faculties now manifest themselves as half conscious intellectual abilities, intuitions, aversions and drives: as cognitive instincts.

Notice that it is not being claimed that our mathematics, logic, philosophy or our empirical science were biologically selected. This biologization is maintained only for a small methodological foundation, and our knowledge claims would be an epiphenomenon resting on this small foundation. Notice also that all that we are told about these innate capacities is that they lie behind scientific methodology, and that they lie behind some intellectual human drives and aversions; observe as well that all the evidence about their existence comes from some behavioral regularities of ours, methodological or otherwise.

If correct, this evolutionary epistemology may help explain the ontological "tunnel vision" claimed by Quine as a characteristic of human science,

> ... a physical theory of radically different form from ours, with nothing even recognizably similar to our *quantification or objective reference, might still be empirically equivalent to ours, in the sense of predicting* the same episodes of sensory bombardment on the strength of the same past episodes (...) our science has developed in such a way as to maintain always a manageably narrow spectrum of visible alternatives among which to choose when need arises to revise a theory. *It is this narrowing of sights, or tunnel vision that has made for the continuity of science, through the vicissitudes of refutation and correction.* And it is this also that has fostered *the illusion of there being only one solution to the riddle of the universe* (W. V. Quine, 1975, p. 81. Emphasis added).

Contra Quine, there could well be only one solution to the riddle of the universe, otherwise, how does Quine know that this alleged "tunnel vision" is an illusion? On the other hand, the existence of a tunnel vision is debatable given what we know of theoretical change (for example, in the conceptual and ontological axes) during scientific revolutions and, some would add, given also what we know of scientific methodological and axiological change during the development of science [6]. Otherwise, since it is uncontroversial that change in scientific theories, and also to *some degree* in scientific methods and goals, has happened in the sciences, in what sense can we still talk of a tunnel vision?

Still, if we were to grant to Quine the existence of this tunnel vision, EE could then help explain this tunnel vision via EE's claim that human culture, and science in particular, are constrained and channeled into certain fixed paths, by mental capacities and dispositions programmed in our minds by biological evolution. If so, our biologically constrained modes of thinking must be wide or flexible enough to allow for the recorded variations in scientific concepts, ontology, methodology and aims. These cognitive instincts of ours must deal only with the most general features of our scientific reasoning and not with the specifics, the minutiae, of alternative methodologies; this must be so, since there is no consensus about fine methodological points.

The existence of these cognitive instincts gets some empirical support from anthropological, psychological and ethological studies, thus [7]:

i) The existence of innate human abilities is suggested by the universal capability of healthy humans for language, for musicality, and for basic arithmetic conceptualizations and procedures.

ii) We seem to have hereditary inclinations to think casually and analogically. So,

> We show untaught appreciations of similarity and difference, as are needed in order to think analogically. Likewise in the case of causality and other modes of thinking. (...) Humans, like other primates, automatically associate heights with falling, snakes with danger (M. Ruse, 1986, p. 165).

iii) We seem to have congenital conceptualizations, thus all healthy humans unconsciously classify colors in four basic categories, blue, green, yellow, and red. Thus,

> unconsciously, we break colors up into four basic categories, People of radically different cultures, thinking quite unrelated languages, use much the same classificatory schema (M. Ruse, pp. 143-4).

The conclusion is that we are not born with passive *tabula rasa* minds, and that instead we are born with some innate inclinations to certain thinking patterns and to certain patterns of behavior.

Now, from the perspective of EE, our innate capacities have a contingent character; EE tells us that these instincts could all be strictly wrong and improved. That is, according to EE given different chance mutations, our present intellectual capacities might not have arisen, and even if these chance mutations had already arisen, these capacities might not have been selected given a different sequence of primitive habitats, because they could have been of little or no use in such habitats.

On the other hand, our most basic logical intuitions provide for us the conditions to think rationally, and the rational denial of these deep-seated logical intuitions of ours is very difficult to conceive, if at all [8] then impasse. Either EE is wrong or we are the victims of confusion, a confusion to which we are inevitably urged by our prehistoric biological programming.

> Taking an evolutionary perspective, we must acknowledge the contingency and explicability of our present ways of thinking, and in particular our present ascriptions of necessity. But if we do regard some things as necessarily true we thereby deny their contingency and cannot countenance the possibility of alternatives to them. We must simultaneously appreciate the contingency of the fact that the limits of our thought lie just where they do while remaining unable to think beyond those limits. It is not easy to hold consistently to both points of view simultaneously, and we inevitably find ourselves moving back and forth somewhat unsurely between them. That is perhaps inevitable when we try to stand outside the evolutionary process and see it as a whole, *sub specie aeternitatis,* while the terms we use to try to understand that process and our place in it are themselves products of the very process we are trying vainly to transcend (B. Stroud, 1981, pp. 247).

Is it possible to understand human beings as part of nature and still maintain that we have cognitive access to *a priori correct* norms? That is, do we have the putative ability to know some truths or some methodological norms based on reflection alone? EE claims that what we consider *a priori* norms or truths is only so from a synchronous psychological perspective, EE claims that *a priori* knowledge is the result of a contingent ancestral evolutionary implant; on the other hand, *a priori* truths appear

to us to have a necessary character, a necessariness which they could objectively have.

Then, if it were granted that our cognitive capacities have a biological origin, would this evolutionary genetic explanation of the programming of our brains or minds *justify* as correct the content of the program itself?

I.

In what follows, I will argue for a negative answer to the last question, but first, I will try to articulate what an argument from EE in favor of a belief in the reliability of our cognitive capacities, as transmitters or producers of truths, would look like. The justificatory EE argument would go as follows:

a) We have good reasons to hold that our cognitive system, and in particular our scientific methods, are on the whole reliable as producers (for example, of true observational statements) and as transmitters (i.e., as inferential rules) of truths.

b) It is rational to believe that the theory of evolution is if not strictly true, at least is probably close to the truth (or if not, that it is at present, amongst all its competitor theories, the empirically most adequate theory). The belief in the theory of evolution is rational, because this belief has been well corroborated or confirmed by the empirical evidence—as produced, selected and interpreted by our in general reliable cognitive system.

c) The theory of evolution claims that we are the result of natural selection, of biological evolution.

EE adds to these premises the following ones:

d) Our cognitive system is *only* a result of the evolutionary mechanisms entertained by *contemporary* biological evolution theory [9].

e) Organisms selected as fittest for survival have close to optimal characteristics or systems [10].

f) An evolutionary optimal cognitive system would be an overall reliable cognitive system [11].

It now follows from premises (a) through (f) the conclusion (C): It is rational to believe that our cognitive system is in general a reliable cognitive system.

Let's take, for the time being, all the previous premisses for granted and focus in the structure of this argument. We notice that premiss (a) is equivalent to the conclusion C, and we discover that to obtain C we require of (a), because without (a) we wouldn't obtain (b), and this last premiss in conjunction with (c), (d), (e) and (f) provides C. Hence, there is circularity and this circularity is inevitable given that in this argument there is no alternative evidential route leading to C, that is, without (a). Furthermore, the argument is viciously circular because: i) being circular

it intends to be probative, i.e., it pretends to have a justificatory character, and ii) because at least one of its premisses [premiss (a)] is as problematic, as doubtful or as implausible as the conclusion C. Thus,

> An argument in *persuasion dialogue* can be useful to persuade or convince the respondent to whom it is directed only if the premisses are already secured as commitments of the respondent *so that for him they are more plausible than the conclusion that he doubts or questions*... Certainly this is true in persuasion dialogue because the premisses must be commitments of the respondent that are, from his point of view, more plausible than the conclusion. They must be, to be useful *to prove the conclusion to him* successfully (D. N. Walton, p. 321. Emphasis added).

On the other hand, in a demonstrative argument—such as in those of Euclidean geometry—the premisses should not only be more plausible, but also,

> ... be firmly established as better known to be true than the conclusion to be proved. This context, or one very like it, appears to be indicated in the remark of Aristotle (*Prior Analytics* 64 b 30) where it is required of a demonstration that the premisses should be better known or established than the conclusion to be proved from them. In other words, Aristotle was saying that a *demonstration* is a special kind of argument where the premisses are better known than the conclusion. Therefore, in terms of evidence or knowledge, the premisses are prior to the conclusion in a demonstration. Hence it follows that the conclusion cannot be at the same time prior to the premisses. The inquiry or demonstration is even more strongly inimical to circular reasoning, and apt to classify it as fallacious, than the persuasion dialogue (D. N. Walton, p. 324).

A viciously circular argument is then pointless both as a persuasive and as a demonstrative argument. In the previous argument from EE in favor of a belief in the reliability of our cognitive capacities, these capacities, and the scientific method they make possible, are used to justify (via the biological theory of evolution) these same capacities and scientific method. Thus, the theory of evolution is identified as scientific, it is tested, and it is evaluated with the help of the very same methods we would like to justify, at the end, what has been done is to show that some scientific methods are behind the very same scientific methods. The argument is viciously circular because it purports to give a reason for trusting our cognitive methods, but the argument itself is trustworthy only if those same methods (at least those required by the premisses of the argument) are indeed trustworthy. Hence, we only get back what we put in. If not, how do we know which are the archetypes of reliable scientific theories? If not, why not use "creation science" instead of Darwinism to provide us with the answer about the origin, and with the justification, of our cognitive instincts?

The EE theorist has presupposed that we know that Darwinism is a well-corroborated essentially correct *bona fide* scientific theory. But this conclusion of his, if rational, must have been inferred by applying methodological rules, the very same rules he wants to justify via Darwinism. Therefore, there is here a vicious argumentative circle: we assume as a premiss the conclusion to be proved, and hence the premiss is as doubtful, as problematic as the conclusion. This reasoning, if used to accredit our methodological principles, is fallacious, and this would be the case even if the argumentative circle were not obvious because it were very broad and inclusive.

The circularity is especially clear in the case of induction; thus, the evolutionary perspective assumes that the cognitive intuitions that worked in the past will go on working in the future. However, why so? Because of an inductive inference. The inclination to make inductive inferences exists in our minds (EE would say) because of its past survival value, and this inductive inclination of ours in turn predisposes us to assume that induction's survival value will be conserved in the future. The inductive bias of ours, however strong, cannot justify itself, because,

> That past facts led to assumptions being built into us that fit them does not mean that those facts will continue to hold and those assumptions will continue to serve us (R. Nozick, 1993, p. 123).

We are back to a situation akin to Hume's psychological explanation of our inductive or causal reasoning, though this time the explanation is biological. We are told that we have been pre-programmed with certain thinking patterns, but from this supposed biological destiny, we cannot conclude that we are rationally justified in employing these thinking patterns. That is, there is no non-circular evolutionary reply to the skeptic who would question our inductive intuitions.

Still some 'circularities' have been defended arguing that we sometimes find them in standard explanatory or causal sequences such as autocatalytic reactions (i.e., chemical reactions where a reaction product catalyses at some time t_1 its own generation at a later time t_2). So,

> ... *circles* of *explanation* may be perfectly acceptable. My being good at tennis explains my desire to play, which explains my hours of practice, which explains my being good at tennis (A. H. Goldman, p. 45. Emphasis added).

That is, my being good at tennis (at t_1) explains my desire to play (at t_2), which explains my hours of practice (at t_3), which explains my being even better at tennis (at t_4), where $t_1 < t_2 < t_3 < t_4$. Now this sequence is not circular, it is rather a causal diachronic chain. Similarly, Goldman's following

argument again is not a circular justificatory argument, but rather a causal explanatory chain.

> Use of the principle of inference [to the best explanation] explains our belief in natural selection and its metaphysical framework, which explains how that cognitive mechanism evolved for its capacity to preserve truth, which *explains* both why we use the principle and why we *ought* to use it (A. H. Goldman, p. 45. Emphasis added).

Again, use of the principle of inference to the best explanation (at t_1) explains our belief in natural selection (at t_1), which explains how the principle of inference to the best explanation evolved (at t_0). And this in turn explains why we use the principle (at t_1), where $t_0 < t_1$. Goldman's last argument may explain why we use the principle of inference in question but it does not answer "why we ought to use it". Where does the 'ought' come from? It is not provided by the evolutionary causal explanation, except if it could be shown that the principle in question preserves truth, and EE cannot do this without circularity. Otherwise, a causal explanation of the principle of inference to the best explanation doesn't prescribe that a rational agent ought to believe this form of inference.

The most we can infer from these examples of Goldman's is that causal diachronic chains (not circles of explanation) are standard explanatory strategies. Let's recall, on the other hand, that what we are looking for is not for explanations but for justifications to our cognitive capacities, and that our question was whether circular justifications were acceptable.

EE may offer causal or genetic explanations for the innate contents of our minds, EE may explain how our mental capacities arose, but EE does not provide us with grounds for accepting the validity or reliability of our intellectual faculties. A question then arises: Ought we to follow the dictates—if any—of evolution's mind programming? That is, can the crucial normative aspect of epistemology be validated biologically?

This question is pertinent, because if we were to blindly follow the intellectual intuitions and drives encoded in the collective subconscious of our phylogenetic line in a remote past, we would be mere automata. Thus, one would believe in logic merely because one was biologically programmed to do so, and not because logic is correct. Thus,

> I can have no justification for trusting a reasoning capacity I have as a consequence of natural selection, unless I am justified in trusting it simply in itself—that is, believing what it *tells* me, in virtue of the *content* of the arguments it delivers.
> ... the recognition of logical arguments as independently valid is a *precondition* of the acceptability of an evolutionary story about the source of that recognition. This means that the evolutionary hypothesis is acceptable only if reason

> does not need its support. At most it may show why the existence of reason need not be biologically mysterious (T. Nagel, 1997, p. 136).

Again, Goldman's last argument doesn't prove or logically support the principle of inference to the best explanation, because to justify this principle as correct is different from causally explaining its origin, that is,

> Evolutionary epistemology commits a mode of *genetic fallacy*. The "genetic fallacy" confuses the course of historical development with one of probative justification, for example, by arguing from the fact that a doctrine has a somewhat reputable (or disreputable) origin that it must be tenable (or untenable). The Darwinian epistemologist in effect argues in just this way, moving from historical survival to the presumptive correctness of methods. Surely no such *transcategorical* inference from the *factual* issue of historical considerations to conclusions regarding the issue of the *normative* validation of a method can possibly be valid. One cannot move from the historical order of temporal development to the logical order of probative concatenation (N. Rescher, p. 135).

In contrast, the origin of a group of cognitive faculties can sometimes provide a reason to doubt the reliability (i.e., provide a 'defeater'[12]) of such a group of intellectual capacities. For example, suppose I was to believe that I was created by a malevolent Cartesian demon, a demon that designed me so that I believe mostly false beliefs. Then this belief about the origin of my beliefs will provide me with a defeater for my spontaneous belief in the reliability of my cognitive capacities.

Now, to have a defeater for my belief in the reliability of my cognitive capacities (R, for short) it is not necessary that I believe that in fact a Cartesian demon interferes with my mind, to have a defeater it is enough that I could not pronounce myself, one way or the other, about such a demonic scenario. In such an agnostic situation, I would have a reason to be agnostic about R and about any beliefs generated with the help of my cognitive capacities.

And we discover that belief in EE provides a defeater for R just as the Cartesian demon did in the fanciful previous scenario. Thus, let's grant that our cognitive capacities were selected to promote our survival, our survival, however, can be promoted by cognitive capacities that have as an aim something less than truth, this because truth is not always biologically useful, i.e., cognitive capacities that had as an aim truth could be uneconomical time and energy-wise.

If our intellectual capacities have a biological origin then these capacities are the result of selective compromises, of imperfect adaptations. Natural selection, biological evolution, is not interested in true belief but in appropriate behavior, that is, in behavior conducive to fitness, i.e., in behavior maximizing survival and reproduction.

Hence, even if it could be somehow proved that our minds are born wired with some epistemic and axiological presuppositions, and furthermore, even if it could be shown that this programming was a result of Darwinian natural selection, this would not be enough to show that these innate mental contents of ours are the right, the correct ones [13]. Because,

> Complete veridicality is probably not, in evolutionary terms, cost effective. Organisms that must act to survive must process information. They must do so reasonably well, and reasonably fast. Quick computing cuts corners... Both physiological and cognitive adaptation is asymptotic; the residual gap, however small, renders *all* 'knowledge' uncertain (N. Tennant, p. 33. Emphasis added).

Consequently, about the correctness of our cognitive instincts, some agnosticism might be prudent,

> ... the horrid doubt always arises whether the convictions of man's mind, which has been developed from the mind of the lower animals, are of any value or at all trustworthy. Would any one trust in the convictions of a monkey's mind, if there are any convictions in such a mind? (Charles Darwin.)

And because of the rapidity with which cultural change has proceeded our present brain must have got its present capabilities very early in its evolution. Hence, an evolutionary explanation of our cognitive faculties would warrant serious doubts about the reliability of our cognitive faculties when theorizing beyond a limited domain.

> The question is whether not only the physical but the mental capacity needed to make a stone axe automatically brings with it the capacity to take each of the steps that have led from there to the construction of the hydrogen bomb, or whether an enormous excess mental capacity, not explainable by natural selection, was responsible for the generation and spread of the sequence of intellectual instruments that has emerged over the last thirty thousand years (T. Nagel, 1986, p. 80).

Therefore, there would be no reason to trust the results of our intellectual capacities in endeavors such as biological evolution. Hence, an evolutionary explanation of our cognitive capacities would then also warrant serious doubts about the correctness of this evolutionary explanation itself. EE is then self-undermining, self-defeating.

II.

The probable unreliability of our cognitive faculties—if these capacities were to have *only* a Darwinian origin—merits more attention. Thus, there are contrary opinions about the value of the probability (P) of our cognitive capacities being reliable (R) overall, when functioning properly, and

conditional on the correctness of EE: P(R/EE). Which opinion is favored about the value of P depends in turn on which theory is held about the causal connections between beliefs, desires and behavior [14], if one holds, for example, that from adaptive behavior nothing follows about the truth-value of beliefs then we will favor a low value for P(R/EE). Contrariwise, if adaptive behavior makes probable true beliefs, then P will have a high value.

Quine believes that P has a high value, because he thinks that belief and behavior are linked closely, in such a way that abundant and basic false beliefs will lead to radical maladaptive behavior and extinction, so,

> Creatures inveterately wrong in their inductions have a pathetic but praiseworthy tendency to die before reproducing their kind (W. V. Quine, 1969, p. 126).

While others like Darwin (cf. quote above), and Patricia Churchland appear to believe that the value of P is low, possibly because they think that behavior and belief are only weakly connected. Thus,

> Boiled down to essentials, a nervous system enables the organism to succeed in the four F's: feeding, fleeing, fighting and reproducing. The principal chore of nervous systems is to get the body parts where they should be in order that the organism may survive... Improvements in sensorimotor control confer an evolutionary advantage: a fancier style of representing is advantageous *so long as it is geared to the organism's way of life and enhances the organism's chances of survival*. Truth, whatever that is, definitely takes the hindmost (P. Churchland, p. 548).

Nevertheless, one can speculate that it is unlikely that our methodological instincts can be far from the mark, that they can be seriously wrong:

i. Because our cognitive capacities appear to have served us well [15] in the study of multiple aspects of the world, and in evaluating an enormous range of different hypotheses of diverse generality and depth. Moreover, our cognitive instincts seem to form a coherent web.

ii. If evolution is not understood as just searching for adaptation, but rather as searching for adaptability [16], and if such a reinterpreted Darwinism were correct, then the innate contents of our minds would have been selected because they provide us with adaptability to a wide spectrum of possible niches and not merely adaptation to some primitive circumstances. That is, our mental cognitive capacities would not be just the right-enough ones for some narrow set of habitats. And since, one would suppose that the ideally right intellectual expectations and rules of method provide the most adaptability value, we could expect our deepest cognitive intuitions and inclinations to be the correct ones, or at least not to be far from the correct ones [17].

iii. The prospects for evolution to have landed on the best or the correct method(s) are high when one considers that the selective process of methodological evolution has a relatively reduced range of methodological possibilities from which to choose. Because the range of possible ultimate methods of thesis evaluation is relatively small, when compared with the astronomical number of possible substantial theses to be evaluated.

Given the conflicting good arguments about the value of P(R/EE), it seems sensible—it seems rational—to opt for agnosticism about P(R/EE). Agnosticism about P(R/EE) implies agnosticism about R [18], which in turn implies agnosticism about *any* belief B generated with the help of R. In particular, agnosticism about P(R/EE) implies agnosticism about belief in EE itself. The rational recommendation is, therefore, to suspend judgment about EE, in other words, it is being said that it is a-rational to hold a belief in EE. This argument can be analyzed as follows:

a) The probability P(R/EE) that our cognitive capacities [19] are reliable given EE cannot be known.

b) We then have a good reason to suspend judgment about R itself, that is, about the reliability of our cognitive capacities (assuming there is no further evidence in pro or against the reliability of all or some of our capacities).

c) However, if somebody doubts R then he has a good reason to doubt *any* beliefs [20] validated by R, in particular, one has a good reason to be agnostic about EE. This reservation about the correctness of EE will hold, except if there were some ulterior argument (a 'defeater') undermining the reasons to doubt EE. Now, any such defeater argument will involve at least some belief B, as a premiss, and any such belief B will also be doubtful, because R itself is doubtful. That is, B will be also the result of our doubtful cognitive capacities, and consequently B will be in doubt, as will be, the defeater involving B. Thus, in the end, EE defeats itself and this self-defeat is undefeated. In summary, there is no way to defeat our doubts about EE, once we become aware that EE throws doubts on R (i.e., on the reliability of our cognitive capacities) and on any beliefs generated via R.

d) EE then undermines itself, because if EE were true, then we would have reasons to doubt it.

e) Therefore, the rational recommendation is to suspend judgment about EE.

Otherwise, it is a-rational to hold a belief in EE, notice that what is a-rational to believe is evolutionary epistemology (the thesis that biological evolution, as *nowadays* understood, can *by itself* explain the reliability of our cognitive capacities). And that it is not being said that it is a-rational

to believe in biological evolution itself. On the other hand, from the a-rationality of a belief in EE it doesn't follow that EE is false, not even that it is rational to believe in the falsity of EE.

Now, if one believes—as most of us do because of an instinctive faith—that our cognitive faculties are in fact overall reliable [21], then we get a contradiction with the previous agnostic recommendation about R. An agnostic recommendation we ultimately got from EE, this contradiction would then provide an argument against the correctness of EE, i.e., an argument for the irrationality of a belief in EE.

If the recommendation for agnosticism about EE is granted, then the problem arises of how to explain the origin, and how to justify our cognitive capacities. Concerning the origin of our intellectual faculties we are left with only three main alternatives:

a) Leave it as a mystery,

b) a supernaturalist (theist or deist) explanation, or,

c) Nagel's speculation about some yet unknown natural processes or laws of nature as responsible of our cognitive capacities.

As for the justification of our capacities, one must conclude that EE fails to provide a non-viciously circular justification for our cognitive capacities, and that even if it did, this justification would be dubious given the suspicion on EE of a-rationality (and even of irrationality). Then, either the justification is to be found somewhere else [22], or we might have to resign ourselves to accept our cognitive capacities as reliable without a non-viciously circular justification, that is, dogmatically.

NOTES

1 A cognitive faculty is reliable if the great majority of its deliverances are true when it functions properly and in a standard situation.

2 As will be discussed further below, a belief in an evolutionary explanation of the reliability of our cognitive capacities is suspect of being a-rational, if not irrational.

3 Intuitive judgments are pre-analytic judgments but not arbitrary ones, and intuitive judgments can be improved by training and by gaining in expertise. The following examples will help illustrate the important role played by our cognitive intuitions.

a) A first example is provided by Nelson Goodman's projectable and non-projectable predicates. Goodman showed that it was not possible to rule out predicates like 'grue' on purely formal grounds. And this then left common sense, and finally intuition, as the only possible way for scientists to distinguish between projectable predicates and non-projectable ones.

b) Duhem also argued for scientists' intuitions or 'good sense' as a necessary addition to deductive logic. Good sense would provide, for instance, a way to decide what to preserve and what to reject when a lattice of hypotheses is empirically refuted as a whole.

> These motives that do not proceed from logic and yet direct our choices, these 'reasons which reason does not know' [...] constitute what is appropriately called good sense (Duhem, p. 217).

c) Furthermore, intuitive judgments are also found in the subjective Bayesian approach, which requires inputs of prior probabilities, these priors, however, can be unreasonable and lead to bizarre results:

> ... differences in the prior probability function can lead to violent differences in the actual degrees of support assigned to theories, ..., these differences can amount to what would ordinarily be considered as gross irrationalities (...) The extent to which this is true is in fact rather shocking. Arthur Burks has in fact shown that there are even 'counter inductive prior probability functions'. That is, there is a certain logically possible prior probability metric such that if a scientist had that metric then as more evidence came in for a hypothesis (using the term more evidence on the basis of our normal inductive judgments) then the scientist would assign lower and lower weight to the hypothesis for a very long time (Putnam, 1981, p. 192).

The need then arises to distinguish between reasonable and unreasonable priors and for this, the scientists' intuitive judgments have to be welcomed. This because,

> There does not seem to be any good reason to think that there would be a set of rules which could distinguish between reasonable and unreasonable priors and which would be any simpler than a complete description of the total psychology of an ideally rational human being (Putnam, 1981, p. 192).

4 How to characterize 'proper function' is a difficult problem, cf., for example, Plantinga's chapter 11.

5 That is, without invoking any other possible natural or supernatural causal agents.

6 For example, L. Laudan in his *Science and Values* argues that all scientific theories, methods and aims can change.

7 Cf. Ruse (1986) pp. 141-68.

8 One might speculate, for example, that there could exist alternative evolved intelligent beings somewhere else with bizarre ultimate methodological rules and aims. But, could we argue, and even communicate, with beings that would reason with a collection of basic cognitive intuitions disjoint from ours? While a partially differently wired rational mind may be conceivable (a mind, for instance, that would not reason numerically), one that would deny the necessary truths that we hold, one that would have ultimate cognitive principles contradictory to ours, would be considered by us to be confused or insane, or if not, as ineffable and unintelligible. A minimal set of cognitive intellectual strategies and intuitions shared with ours is going to be a necessary characteristic to ask from any understandable rational agent, from any agent with whom we could debate. Our most basic cognitive instincts, therefore de facto function as if they were universally binding, as if they were the objective right ones, which, on the other hand, they could well be.

9 Thomas Nagel has challenged this premiss, he claims that there is no reason to believe that "every noteworthy characteristic of human beings, or of any other organism, must have a Darwinian explanation". Nagel adds,

> Why not take the development of the human intellect as a probable counterexample to the law that natural selection explains everything, instead of forcing it under the law with the improbable speculations unsupported by evidence? (Nagel, 1986, p. 81).

But then how to explain our intellectual faculties and their possible reliability? Nagel finds it incredible that the appearance of our minds is a natural accident (cf., Nagel, 1997, p. 132), and therefore Nagel speculates that our cognitive capacities are the result of so far unknown natural laws and constraints.

10 This premiss and the following one have been disputed by P. Stich, cf., pp. 63-70, he argues that the denials of these two premises are wholly compatible with contemporary evolutionary theory, and not unlikely with respect to it.

11 This last premiss has also been questioned by A. Plantinga, his argument is discussed further below.

12 A 'defeater' of some belief is roughly a reason (or possibly also an experience) to doubt the reasons for that belief, for a better characterization of the concept of defeater, consult Plantinga's forthcoming paper, in Beilby (ed).

13 For example, wishful thinking could well be the result of biological evolution, given its adaptive value in terms of emotional well-being.

14 Cf., Plantinga's chapter 12 for more on these conflicting positions.

15 However, to rationally assert that "our cognitive capacities have served us well" we need of these same cognitive capacities, and again there is circularity, therefore this argument is not conclusive.

16 C. H. Waddington, Hahlweg and Hooker defend evolutionary progress as increased adaptability.

17 One must keep in mind, however, that the development of cognitive capacities is just one of the many possible strategies open to a biological lineage in its way to more adaptability. Thus, other species have achieved high adaptability by emphasizing efficient reproduction (i.e., brief gestation periods with abundant offspring) instead of intelligence.

18 If one is a believer of EE, and if there is no argument against agnosticism about R.

19 This premiss is a simplification since it is well possible that the reliability of some of our cognitive capacities is less doubtful than that of others. Plantinga recognizes this and says,

> ... we have been lumping together all of our cognitive faculties, all of our sources of belief, and all the sorts of beliefs they produce. But perhaps these different sorts of faculties should be treated differentially; clearly the argument can be narrowed down to specific faculties or powers of belief-producing mechanisms, with possibly different results for different cases. And surely the argument does apply more plausibly to some cognitive powers than to others...
> ... even if you think Darwinian selection would make it probable that certain belief-producing mechanisms—those involved in the production of beliefs relevant to survival—are reliable, that would not hold for the mechanisms involved in the production of the theoretical claims of science, such beliefs, for example as E, the evolutionary story itself (Plantinga, pp. 232-3).

Consequently, the believer in EE ends if not with a defeater for any belief, yes with a defeater for belief in EE itself.

20 It may appear as too strong to say that any beliefs backed by R would be doubtful, since then even a belief in necessary truths would also be doubtful. Well, if R claims that all our cognitive capacities are reliable, and if R is doubtful, then there would appear reservations also about those cognitive capacities that permit us to discover the irresistibility of necessary truths.

21 This animal faith in R could be expressed by asserting that R has intrinsic warrant, i.e., by saying that R doesn't get its warrant on the evidential basis of any other beliefs, in particular not from a belief in EE. In other words, it would be held that R has so much intrinsic warrant that R cannot be defeated by the fact that P(R/EE) is inscrutable. But this is another way of saying that R doesn't require justification, because we cannot or will not doubt it. If so, what is being said is that R is a dogma.

22 An alternative justificatory strategy could go as follows:
Our cognitive capacities—and the basic research methods that they back or generate—have shown their fitness by their continuous historical use in a prima facie rational community, i.e., a human community, in particular in a scientific community. Otherwise, the continued use of these cognitive capacities—or of the methods they generate—by a rational community warrant them as reliable.
Survival of some cognitive instincts in a *rational* community, however, assumes precisely what we want to explain and justify: rationality. To *rationally* appraise, to revise and improve our cognitive methods we would have to rely on some *justified* basic rational standards. For example, one would need basic methods such as induction, and standards of what constitutes good empirical evidence; one would need these basic methods to be able to learn from experience. These basic methods are the preconditions for passing empirical judgment on the comparative effectiveness of any other method.
With these justified methodological foundations we could then proceed to learn *rationally* (via a cultural process) more about the failures and adequacies of any other methods. For this, though, we require of this justified methodological fulcrum, the problem is that the non-viciously circular justification of this methodological fulcrum appears not to be available.

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