The Concept of Fallacy is Empty
A Resource-Bound Approach to Error

John Woods

Department of Philosophy, University of British Columbia, Vancouver, Canada,
and Department of Computer Science, King’s College, London, UK
woodsj@dcs.kcl.ac.uk

1 The Origins of Fallacy Theory

In recent years model-based reasoning has achieved a certain prominence among logicians and cognitive scientists. Its repute is deserved, notwithstanding that it has some vigorous rivals. Although both model-based and non-model-based systems aim at elucidations of good reasoning, there are certain issues that challenge them equally across the lines of their respective theoretical and methodological differences. One of these challenges is as old as the history of systematic logic itself. It is the challenge to identify, analyze and set conditions for the avoidance of fallacious reasoning. Aristotle defined a fallacy as an argument that appears to be a syllogism but is not a syllogism in fact. A syllogism is a (classically) valid argument, none of whose premisses is redundant and whose conclusion is neither identical to nor immediately inferable from any single premiss, hence is derived without circularity. Aristotle further provides that syllogisms not have multiple conclusions; and it follows from the non-circularity requirement that syllogisms not have inconsistent premisses. It is widely assumed by logicians of the present-day that syllogisms are of little relevance to the concerns of contemporary logic. This is a mistake. Aristotle’s syllogistic is the first ever relevant, paraconsistent, intuitionist, nonmonotonic logic.
Syllogisms arise in the context of an attempt by Aristotle to discipline the distinction between genuine and merely apparent (or sophistical) refutations, although it is clear that syllogisms may also serve in demonstrations, instructional arguments and examination arguments. Fallacies likewise arise in the context of refutation-arguments. But here too Aristotle sees that they are easily committable in other contexts of reasoning and argument. In the case of refutations, the difference between a genuine and sophistical refutation is that the former embeds a syllogism and the latter embeds what only appears to be a syllogism. Since mistaking a non-syllogism for a syllogism is a fallacy, then mistaking a sophistical refutation for a refutation is also a fallacy.\footnote{Aristotle describes the tie between syllogisms and refutations at \textit{On Sophistical Refutations} 171\textsuperscript{a}, 1-5: ". . . it is altogether absurd to discuss refutation without first discussing syllogisms; for a refutation is a syllogism, so that one ought to discuss syllogisms before describing false [i.e. sophistical] refutation; for a refutation of that kind is merely an apparent syllogism of the contradictory of a thesis."}

Aristotle was plainly of the view that fallacies are a seductive and common fault. The large and dense \textit{Topics} and the shorter and more accessible \textit{On Sophistical Refutations} devote a number of passages to fallacies and to how they might be spotted and avoided. Notwithstanding the more formal treatment of syllogisms in the \textit{Analytics}, in these earlier treatises Aristotle is much concerned with giving the actual reasoner on the ground practical instruction by which he might be guided in the transaction of his reasoning tasks. Indeed we may say that the founder of logic was the first applied logician. Parts of the Aristotelian taxonomy have not been preserved in what is now regarded as the traditional conception of fallacy, but there can be no serious doubt that the tradition retains much of the flavour of Aristotle’s original idea of them.

It cannot be said that Aristotle had much success with his fallacies programme. His original list of thirteen sophistical refutations is discussed scatteredly throughout \textit{On Sophistical Refutations}, mainly in chapters 4 5, 6 and 7. Altogether there are over thirty passages in which fallacies are considered. But no one thinks that any of this comes close to forming a comprehensive and credible account. It is possible that Aristotle abandoned the task of fallacy theory owing to the almost correct proof in the \textit{Prior Analytics} of the perfectability thesis. This is the claim that every inapparent syllogism can be shown to be a syllogism using finite methods which themselves are entirely obvious. This is an amazing feat. It comes close to showing that the property of syllogisity is effectively recognizable. It is also possible that Aristotle worked up a comprehensive account of the fallacies in texts that have not survived. A third possibility is that Aristotle quit the fallacies project on account of its difficulty.

\footnote{is secured by the premise-irredundancy condition. Its intuitionistic character arises from the requirement that a syllogism not have multiple conclusions. (See, regarding the link between non-multiple conclusions and intuitionism, [4]. See also [5].}
We now leap ahead to 1970, the year in which C.L. Hamblin published *Fallacies* [6]. In that work Hamblin excoriates his fellow logicians for having given up on the fallacies programme, and he traduces writers of the introductory textbooks of the period for restricting their accounts of fallacies to ludicrous caricatures and puerile definitions. Goaded by Hamblin’s criticisms, there has been a kind of renaissance of the fallacies project, especially among informal logicians [7], [8], although contributions have also been forthcoming from a scattering of logicians who are more in the logical mainstream.[⁶] But here too it cannot be said that the efforts of the past nearly forty years have produced much by way of a settled theoretical consensus among logicians— as much a result of neglect as of doctrinal differences. It takes little reflection to see that this very fact constitutes one of the imperatives of fallacy theory itself. It can now be expected to answer the question, “Why is fallacy theory so difficult?”

### 2 The Traditional Conception of Fallacy

As it has evolved since Aristotle’s day, the traditional conception of fallacies encompasses a rather loose grouping. In [13], the list has eighteen entries: the *ad baculum, ad hominem, ad misericordiam, ad populum, ad verucandam, affirming the consequent, denying the antecedent, begging the question, equivocation, amphiboly, hasty generalization, biased statistics, composition and division, faulty analogy, gambler’s and ignorato elenchi*. [14] discusses seventeen fallacies [15] eighteen, [16] twenty-eight, and [17] only eleven. While all these lists are pairwise disjoint, there is nonetheless a considerable overlap among them. [18, ch. 1] light-heartedly baptized his list “the Gang of Eighteen”.

It has come to be widely held that, on the traditional conception, a pattern of reasoning is fallacious when four conditions are met. (1) The reasoning is erroneous. (2) The reasoning is attractive; i.e., its erroneousness is inapparent. (3) The reasoning has universal appeal; i.e., it is widely resorted to. (4) The reasoning is incorrigible; i.e., levels of post-diagnostic recidivism are high. Let us call this the EAUI conception of fallacy (which has the attraction of being pronounceable “Yowee”). The EAUI conception has had a long history, originating, as we have said, with Aristotle. Fallacy theorists in this tradition have concentrated their attention on the error-condition, and have tended to regard the other three as more or less well-understood just as they stand. This is a regrettable turn of events. No account of fallacies can pretend to completeness as long as it leaves these three conditions in their present largely unexamined state. Nor can an account of an error of reasoning proceed in a principled way without taking into account what the human reasoner’s target is and what resources are available for its attainment. More particularly, the

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⁶ See, for example, [9, 10, 11, 12].
relevant account of error must disarm the objection that satisfaction of the last three conditions is reason to believe that the first condition is not met. For a piece of reasoning that is attractive, universal and hard to do without suggests that it might not be an error after all.

In the case of the more or less traditional list of fallacies – the Gang of Eighteen, – the above pair of observations fall into an attractive kind of possible alignment. Arising from it is a certain model in which all four conditions manage to be satisfied. In it a piece of reasoning is erroneous in relation to a target that embeds a standard that it fails to meet. It is attractive, universal and hard to do without (“incorrigible”) in relation to a more modest target, embedding a lesser standard which the reasoning does meet. The reason is erroneous (in relation to the higher standard) and looks not to be erroneous because, in relation to the lower standard, it isn’t erroneous. Accordingly, the identity, and appropriateness, of a reasoner’s target and its embedded standard precede any assessment of fallaciousness. And we must take seriously the possibility that the usual run of fallacies are errors only in relation to targets that reasoners don’t usually set for themselves.

I want to see whether I can muster some support for two theses about the Gang of Eighteen.

**Negative Thesis.** The fallacies listed in the Gang of Eighteen are either not mistakes or, if they are, are not mistakes which beings like us typically commit.

**Positive Thesis.** Owing to the resource- and design-limitations under which individual reasoners must operate, a significant number of the Eighteen are rationally acceptable scant resource-adjustment strategies. As such, they are cognitive virtues.

Both theses bear on the question of why fallacy theory has made such little progress in spite of being on logic’s agenda (albeit sometimes inertly) for more than two millennia. If the negative thesis is true, the difficulty of getting fallacies right is explained by our directing our efforts at things that aren’t fallacies. It is rather like trying to analyze the genetic structure of radishes by directing one’s probes to marshmallows. Similarly, if the positive thesis is true, the difficulty posed by fallacy theory can be explained by the fact that the Eighteen are attractive, universal and incorrigible because they aren’t errors and are, rather, generally benign methods for the adjustment of our cognitive tasks to our actual interests and our actual cognitive capacities.

### 3 Resisting the EAUI-Conception

It is necessary to pause briefly to take note of a pair of challenges to the EAUI-conception. On the one hand, some logicians are of the view that it is a serious distortion of Aristotle’s founding idea. On the other, there are those who think that, entirely aside from what Aristotle may have thought, it is better to understand the idea of fallacy in some or other non-EAUI fashion. In the
first group one finds Jaakko Hintikka and (perhaps less insistently) Hamblin himself. Hintikka thinks that Aristotle’s idea of fallacy was not the precursor of the EAUI-conception, that Aristotle did not think that fallacies were errors of reasoning or inference and that fallacies are actually mistakes committed in question-and-answer games [19]. Accordingly, if logic were understood in the general manner of the syllogistic (and, afterwards, first order classical logic), fallacies would not fall within its ambit. But, in fact, since logic is actually an inherently interrogative enterprise [19] and [20], fallacies do fall within the ambit of logic, provided that logic is taken in its proper sense.

Hintikka’s interpretation of Aristotle is examined and rejected in [21], with a reply from Hintikka [21]. In much the same spirit, [6, ch. 8] proposes that fallacy theory might better prosper within the precincts of modern revivals of the mediaeval logics of dialogue-games. I myself have a twofold opinion of these suggestions. One is that, apart from their intrinsic merits, they are not proposals that Aristotle would have accepted. The other is that their intrinsic merits are rather dubious. True, some of the Gang of Eighteen – notably begging the question – appear to be dialectical improprieties. But the great bulk of the Eighteen resist such construal; consider, for example, hasty generalization, post hoc ergo propter hoc, false analogy, biased statistics, gambler’s composition and division, affirming the consequent and denying the antecedent.

This is not the place to settle these differences. For present purposes it suffices that I show my hand. Although there are defectors here and there, the dominant view among logicians is indeed that the EAUI-conception is indeed the traditional idea of the fallacies. Since my task is to investigate the Eighteen under this conception, nothing more need be said about these peripheral entanglements. But before quitting this point, it is also necessary to make mention of another – and somewhat related – rump in the fallacies research community. This second group is dominated the Amsterdam School of pragma-dialectics, according to which a fallacy is simply any violation of the discourse rules that govern critical discussions [26]. A similar view is taken in the post-1982 writings of Douglas Walton, who sees a fallacy as an illegitimate move in a conversational exchange which is designed to frustrate the rightful goals of the type of dialogue that the exchange instantiates [27]. My view is that the move to define fallacies in general, and the Eighteen in particular, as

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7 In fact, question-begging is not a fallacy either. See [22].
8 Support for the EAUI-conception is widespread. See [23, p. 172]: “By definition, fallacy is a mistake in reasoning, a mistake which occurs with some frequency in real arguments and which is characteristically deceptive”. See also [24, p. 333]. “Fallacies are the attractive nuisances of argumentation, the ideal types of improper inference. They require labels because they are thought to be common enough or important enough to make the costs of labels worthwhile . . . .” Such a view is also endorsed by [25, p. 1] as “the standard conception of a fallacy in the western logical tradition . . . .”
dialogical improprieties has the effect of substituting a stipulated definition of fallacy for the traditional conception. There is nothing wrong as such with stipulative re-definitions that bring about conceptual change. The concept of straight line had to be adjusted to fit relativity theory and the concept of particle had to be re-configured to accommodate quantum mechanics. But, as Quine has said of the non-classical logics, with stipulative definitions the returns had better be good. For a long time, I have thought that in the case of the dialogical re-definition of fallacy the returns aren’t nearly good enough [18, ch. 9]. I shall return to this point.

4 Errors of Reasoning

It is noteworthy that logic’s historical engagement with error bears dominantly on mistakes of reasoning or misinferences. The concept of error ranges far and wide, encompassing perceptual errors, mechanical errors, faulty memories, factual misinformation, and so on. But logic’s interest does not extend so far. Examination of the fallacies literature discloses a striking complacency about the error-condition. It is taken as given that invalidity and inductive weakness are errors of reasoning just as they stand. This cannot be right, since it provides, among other things, that every inductively strong argument is an error of reasoning thanks to its invalidity. But beyond that, it is quite wrong to think of invalidity and inductive weakness as errors of reasoning in their own right. Not catching this is one of formal logic’s more serious failings. One of the virtues of informal logic is its re-admittance of the concept of agency as a load-bearing item of theory. Of course, informal logic is not alone in this. Much of computer science is agent-based, as are a good many non-classical systems of logic, such as epistemic and deontic logic, situation semantics, logics of defeasible reasoning, and practical logics of cognitive systems. For the most part, however, in all these areas the analysis of reasoning precedes the analysis of reasoners. In most cases there is little or no stand-alone investigation of what reasoners are actually like – of what they are interested in and what they are capable of. To a quite large extent reasoners are merely virtual in these studies. They are posited as beings or devices that implement the theory’s rules, without regard to whatever else may be true of them. This gets things in the wrong order. In what the mediaevals called ordo cognoscendi, a realistic theory of human reasoning requires a prior and independent account of the human reasoner. So I conjecture that

**Difficulty.** One of the reasons that fallacy theory is so difficult is that theorists have not honoured the conceptual priority of reasoners over reasoning.

We may say, then, that one of the clear advantages of an agent-based theory of reasoning is that what the theorist says about reasoning can be informed by what he makes it his business to learn about what reasoners are

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9 A reprint of [28].
like. By my own lights, this is an opportunity that reasoning theorists ignore at their peril. For one thing, trying to sort out how reasoning works and the conditions under which it is good without due regard to what reasoners are actually like is a standing invitation to massive over-idealization.

Perhaps the first thing to notice about human individuals is the extent to which they are cognitive beings. They desire to know—it has a drive to know—what to believe and how to act. It is a drive structured in such a way that its satisfaction comes about only when the desiring subject is in an appropriate cognitive state. At a minimum it is the state of taking some or other requisite proposition as known.

It has long been recognized that reasoning as an aid to cognition. This being so, a theory of reasoning is asking for trouble if it fails to take into account its cognitive orientation of reasoners. So there are two constraints on an account of reasoning that a would-be theorist ignores at her peril. She can ignore the fact that the nature and the goodness of reasoning are affected by what it is like to be a reasoner. She can also overlook that reasoning is intimately connected to the transaction of the reasoner’s cognitive agendas.

All of this has a bearing on the notion of error. We may now say that something is an error only in relation to a cognitive target, and that, thus relativized, an error is a failure to meet an attainment standard embedded in that target.

*The relationality of error.* An individual cognitive agent $x$ commits an error $M$ in relation to his cognitive target $T$ if $x$ fails to meet an attainment standard $S$ for $T$.

Here is an example. Harry wants to produce a sound demonstration of a proposition of topology. He works out a proof. The proof attains Harry’s objective only if it is valid. Validity is the standard here. If the proof is invalid, Harry misses his target. His error is a violation of the validity standard.

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10 Let us also observe in passing that when agents are admitted to logical theory in a serious way, there are two consequences of particular note. One is that logic is pragmatically; that is, it takes on the general colouration of the third member of C.W. Morris’ trichotomy of syntax/semantics/pragmatics [29]. A second consequence is that the admittance of agents to one’s logic has the effect of psychologizing the logic, since if you admit agents you admit them as they come, psychological makeups and all. Taken together, the pragmaticizing and psychologizing of logic give load-bearing significance to agents not just as language-users, not just as the performers of speech acts, but also as the subjects and manipulators of cognitive states. Disdained on both scores by mainstream logicians (after all, there are no people in model theory), this is not a luxury that agent-based theories of belief dynamics, default logics, defeasible logics and practical logics can afford. Whether the mainstream likes it or not, psychologism in logic is now a re-opened research question [30], [31], [31], [32]. Similarly, the pragmatic dimension of agent-based theories has growingly taken hold since the pioneering work of [10], [33], [34], [35], and onwards to the more recent [36] and [37].

11 Ignoring here sublinguistic, subconscious cognition. See, e.g., [38], [39] and [40].
Another example: You and your team are running a drug approval trial in your lab at the Department of Health. Your target is experimental confirmation of the safety or otherwise of the drug. Experimental confirmation is a lofty target, necessarily so in the present case. It embeds a tough attainment standard. It is the standard of inductive strength, usually reckoned in terms of high conditional probability on suitably (and rigorously selected) random samples. If you fail the standard of inductive strength, you have missed your target. Your error in this case is a violation of that standard.

It takes only a moment’s reflection to see that the topological example and the drug trial example are far from typical, to say nothing of canonical. If Harry’s target were to decide whether to attend Sarah’s rather dull annual Christmas party, he would be wasting his time looking for a truth-preserving proof of the proposition that he need not attend, or an experimentally impeccable projection to the same effect from some random sample. In the circumstances, he might be better-served by looking for considerations that give that proposition defeasible or plausibilistic support.

Given the state of play in present-day approaches to defeasible, presumptive and plausibilistic reasoning, it may safely be supposed that many empirically-minded theorists would grant that by a large margin the reasoning of real-life reasoners is rarely in response to targets set so high. Still, the view persists that truth-preservation is better than experimental confirmation, which in turn is better than the more practical targets set by individual reasoners on the ground. On this view, strictest is best and, concomitantly, reasoning that satisfies the attainment standards of the strictest targets is reasoning at its most perfect. On the contrary, when one takes into account the cognitive constitution of the real-life human reasoner, the strictest-is-best thesis loses all credibility.

5 Resource-Bound Agency

I have been saying that a decent theory of reasoning must be rooted in an account of the reasoning agent. Apart from having a cognitive orientation, what else about agency should the reasoning theorist take note of? Of paramount importance is an agent’s resource-boundedness. As anyone who has actually been one will attest, individual agents must transact their cognitive agendas under press of scant cognitive resources – resources such as information, time, storage and retrieval capacity, and computational complexity. The classical literatures on theory change, belief dynamics and decision theory – as well as much of economics, theoretical computer science and cognitive psychology – are careless about giving this fact its due. Even when they recognize these

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12 Important exceptions are [41], [42], [43], [44]. See also [45]. For work done independently of these contributions see [46], [36, ch. 2]. See also [47, ch. 2] [37, ch. 2].
features of human performance on the ground, they marginalize it as a de facto failing, as something that debases an individual’s rationality. Seen this way, the theorist’s normative ambitions must now be prosecuted in the la-la-land of perfect information and logical omniscience, under an approximation relation that no one has ever bothered to define, much less demonstrate the existence of [36].

The limitations on an individual agent’s cognitive wherewithal present themselves in two main ways, both important. They are the typical scantness of the individual’s resources and the typical modesty of his cognitive targets. Scantness is a comparative quantity. Beings like us have less information, less time and less fire-power in the exercise of our cognitive agendas than is typical of institutional agents such as Nato or MI5. Scantness therefore does not strictly imply scarcity. There are instances in which beings like us have all the resources needed to attain our cognitive targets. But often – very often – we do not. It is here that scantness turns into scarcity. It is here that we must do the best we can with what we’ve got. It is a mistake to see this as an assault upon rational adequacy. The rational agent is not someone who is free of setbacks and disadvantages. He is someone who knows how to manage his setbacks and to adjust to his disadvantages appropriately, that is, sensibly and productively. So, then,

Individual agency. It is a defining condition of individual agency that individual agents operate under press of comparatively scant resources.

If, as I say, an agent’s rationality is intimately bound up with how he manages his limitations – if, in other words, the Dirty Harry Principle is a principle of rationality13 – then the second aspect of an individual’s cognitive limitations becomes apparent drops out. Just as the Olympic pole-vaulter does not go into training in order to follow the cow over the moon, the rational agent tends to set himself targets whose attainment in principle lies with his means to attain.

Proportionality of target selection. The individual cognitive agent sets targets that tend to lie within his cognitive reach.

Accordingly,

Target modesty. It is typical of individual agents to set cognitive targets of comparative modesty.

Jointly, then, someone is an individual, as opposed to an institutional, agent to the extent to which his cognitive targets are selected with a circumspection that reflects the comparative paucity and frequent scarcity of his cognitive resources.14

13 “A man’s got to know his limitations” - Clint Eastwood, playing Harry Callaghan in the 1971 movie Dirty Harry.
14 This is not to overlook that institutional agents often are required to labour under press of scarce resources. But comparatively speaking, they typically have more of them, even when they are stretched, than individual agents. And typically, even
We are now positioned to make a fundamental limitation claim about individual agents. In the transaction of their various cognitive agendas, individuals have little occasion to regard either truth-preservation or experimental confirmation as suitable targets. So, in the cognitive lives of individual agents on the ground, it is seldom the case that either validity or inductive strength is the requisite attainment-standard. As for validity, most of the things we desire to do know do not yield to sound demonstrations, and even where they did, finding them is typically beyond the reach of beings like us. We haven’t the time and we haven’t the fire-power and we haven’t the need.\textsuperscript{15} Inductive strength is similarly positioned. It is virtually never the case that individuals have the wherewithal to generate for a proposition the kind of support that a drug trial by Health Canada would provide (if done well) or a well-confirmed scientific theory would provide. This being so, inductive strength in the logician’s technical sense of the term – is hardly ever the standard in play in an individual’s reasoning.\textsuperscript{16} So we must allow that

\textit{Lightening up on validity and inductive strength.} As a default position, one must not attribute to an individual reasoner cognitive targets of which validity or inductive strength are the necessary attainment-standards.

Moreover,

\textit{Not judging them harshly.} As a further default position, a finding that an agent’s reasoning is either invalid or inductively decrepit is not as such a reason to judge it negatively.

At this point I imagine that readers can see where I’m headed. In order to get there quickly, let me simply declare myself on a further methodological point. We have already seen that something is an error only in relation to a cognitive target and its embedded attainment-standard. This works as a direct constraint on \textit{assessment}.

\textit{Attribution precedes assessment.} For any target $T$, before judging an individual’s reasoning against a standard required for $T$-attainment, it must be determined first that $T$ is indeed the target that the reasoner has set for himself.

\section*{6 Goodbye to the Eighteen}

We have it now from the analysis of what reasoners are like together with the attribution-precedes-assessment principle, that except in the presence of particular considerations, to the contrary

\begin{itemize}
  \item when they are stretched, this enables them to select loftier targets than individual agents are typically capable of.
  \item Of course, there is deductivism to be considered. But not here.
  \item Consider here Mill’s claim in \textit{A System of Logic} that induction is not for individuals, but for societies.[48].\end{itemize}
Not typically errors. When performed by individual reasoners, invalid or inductively weak reasoning is not typically an error.

Consequently, 

Not fallacies. Reasoning that is not typically an error is not a fallacy on the EAUI conception.

If we examine the large literature on the Gang of Eighteen, we find a striking consensus to the effect that the mistake embedded in most of these fallacies is either the error of invalidity or the error of inductive weakness. I leave it as an exercise to riffle through the list and tick those that qualify thus. This is a first step in support of the negative thesis that the Eighteen are either not mistakes or are not mistakes committed by us. It does not confirm it outright, in as much as there are items on the list for which, as we have seen, some theorists claim dialectical impropriety and nothing else (petito is perhaps the obvious example.) But if the case that I have been trying to build has merit, the Gang of Eighteen is in shambles and the negative thesis is broadly, if not wholly, confirmed.

I want now to switch our focus to the positive thesis, which says that a good many of the Eighteen are not only not errors, but they are rationally sound scant-resource adjustment strategies. I’ll confine myself to two examples. One is hasty generalization. The other is the ad ignorantiam reasoning. I’ll deal with these in reverse order.

7 Ad Ignorantiam Reasoning

In its modern version the ad ignorantiam is a mistake in the form

It is not known that $P$

Hence, not-$P$.

It is, of course, an invalid schema, and much railing against it has come from the informal logic community on grounds of (2)’s simply “not following” from (1). On the face of it, this is indeed a pretty hopeless kind of reasoning. But if attention is paid to the circumstances in which arguments of this form are actually presented, it is easy to see that they are typically enthymemes the missing premiss of which is an autoepistemic conditional in the form,

If $P$ were the case, I (we) would know that it is.

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17 Even so, I say again that question-begging is not a fallacy. See [22].
18 The term “ad ignorantiam” originated with Locke [49]. As Locke saw it, an ad ignorantiam move in an argument is one in which one of the parties, having presented his case, puts to the other the following challenge: “Accept my case or say something that betters it.” Whatever one makes of such a demand, it is plainly not a EAUI-fallacy. Even if it were a mistake of some sort, it is not a mistake of reasoning.
19 Alternatively,

1. It is not known that $\sim P$
2. Hence, $P$. 
Computer scientists have been long aware that premises of precisely this sort are in play in negation-as-failure contexts. For example, if you consult the departure board at the Vancouver Airport and find no Tuesday flight to London after 9:00 p.m., you rightly conclude that there is no such flight. Your reasoning is autoepistemic.

i. If there were a flight after 9:00 we would know it (from the board).

ii. We don’t know it (the board makes no such announcement).

iii. So, there is no such flight.

Of course, even this is an invalid argument (the board might have malfunctioned), and it certainly has nothing like the inductive support of drug trials. (For one thing, how big is your sample? What is your evidence that it is at all representative? Hearsay doesn’t count). But it is a good argument all the same. Proposition (iii) is detachable as a default from premises (i) and (ii). Similarly, anticipating that he may be late for dinner, Harry’s wife asks whether there will be a Department meeting today. Harry replies, “I take it not, for otherwise I would know”.

It would be wrong to leave the impression that autoepistemic reasoning is error-free. Certainly it is easy enough to be mistaken about the missing autoepistemic premium. If Harry worked at the old IBM, there could well be a meeting without his knowing about it. Harry might have fallen victim to one of those infamous unannounced dismissals over the lunch hour, returning to find his office effects in the hall and the lock on his door changed. Even so, no one would say that it is typical of beings like us to be mistaken about our autoepistemic assumptions. Consequently, ad ignorantiam reasoning of the autoepistemic sort cannot be a fallacy on the EAUI model.

A little reflection shows how useful negation-as-failure reasoning is. It combines two essential cognitive virtues. One is that when we actually resort to it, it tends to be right, rather than wrong. The other is that it is efficient. It achieves striking economies of time and information. (After all, it is based on lack of information.) So I think that we may conclude the ad ignorantiam lends us support to both our theses, the positive as well as the negative.

8 Hasty Generalization

As traditionally conceived of, hasty generalization is a sampling error. It is the error of generalizing from an unrepresentative sample. In the classical literature, one of the standard marks of a sample’s unrepresentativeness is its smallness. Traditional approaches to the fallacies seize on this factor, making hasty generalization the fallacy of mis-generalizing from an over-small sample. By these lights, any would-be analysis of this fallacy must take due notice of two factors. It must say what a generalization is. It must also say what is lacking in the relationship between an over-small sample and the generalization it fallaciously “supports”. In traditional approaches, this is all rather straightforward. A generalization is a universally quantified conditional statement.
And what the over-small sample fails to provide for it is inductive strength, or high (enough) conditional probability. Let us remind ourselves that fallacies are target-relative and resource-sensitive. So we must take care to observe that, even as traditionally conceived of, hasty generalization is not a fallacy as such. It is a fallacy only in relation to a cognitive target of which the production of an inductively well-supported universally quantified conditional is an attainment-standard. It is easy to see that for certain classes of institutional agents – think again of the Health Canada labs or, more expansively, of the whole sprawling project of experimental science – generalizing on over-small samples is indeed an error. It is so precisely when agents such as these set themselves targets that, short of meeting the standard of inductive strength, are unreachable.

It is also easy to see that when it comes to individual agents, the empirical record amply attests to two importantly linked facts. The first fact is:

*The commonplaceness of haste.* For beings like us, small-sample generalization is a widespread practice.

The second fact is

*The soundness of the practice.* By and large, our track record as hasty generalizers is a good one. For the most part, the hasty generalizations we actually commit do not derange the Enough Already Principle.

*The Enough Already Principle.* Beings like us are right enough enough of the time about enough of the right things to survive, prosper and occasionally build great civilizations.

The empirical record discloses a third fact of importance to our enquiry. It is that

*The rarity of universal generalizations.* When beings like us generalize, it is not typically the case that we generalize to universally quantified conditional propositions.20

Why should this be the case? The principal reason is that universally quantified generalizations are brittle. They are felled by any single true negative instance. In contrast, a generic statement, e.g., “Ocelots are four-legged” are elastic. They can be true even in the face of some true negative instances. Ozzie, the ocelot, is three-legged. This topples “For all $x$, if $x$ is an ocelot, then $x$ is four-legged”, but leaves standing “Ocelots are four-legged”.21 This has a two-directional bearing on generalization. From the point of view of instantiation, a true negative instance of a universal conditional carries a twofold cost. One must give up the contrary of the negative instance and one must give up the generalization from which it was inferred. However, a true negative instance from a generic generalization carries only the first cost. We have to

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20 For example: It never snows in Vancouver in April; Sarah always goes to bed before 10:00; Harry is never late in paying his bills; ocelots are four-legged; rhododendrons never do well in Toronto; and so on.

21 Concerning generic statements, see [50].
give up the contrary of the negative instance, but one needn’t give up the
generalization. So there is a striking economy in confining one’s generaliza-
tions to the generic. From the other direction, i.e., in the move from sample to
generalization, there is also an advantage that redounds to the generic. Take
again a sample of ocelots, all of which except for Ozzie are four-legged. There
is no non-trivial generalization of this that we know how to make. True, we
might generalize to “For all \(x\), if \(x\) is an ocelot and is not three-legged, then \(x\)
four-legged.” But this is trivial. We might also generalize to “For all \(x\), if \(x\) is an
ocelot, then \(\text{ceteris paribus } x\) is four-legged.” But this is not a generalization.
It is a generalization-schema, for whose \(\text{ceteris paribus}\)-clause there is, as yet,
no principled and suitably general an explication. In contrast, generalizing to
generic statements, even from samples containing true negative instances, is
decidedly more economical and truer to how beings like us perform on the
ground.

Finally, in the cognitive economy in which resource-bound a gents are re-
quired to perform, haste is a cognitive virtue. It is not always a virtue if it
leads one to error\(^2\), needless to say, but in the case of hasty generalization it
bears repeating that by and large when we \textit{resort to} it, we get it right, not
wrong. So in the form in which we typically do perform it, it cannot be a
fallacy. Such is the providence of the \textit{EAUI} conception.

\section{9 Fallibilism}

I said at the beginning that anyone seeking to produce a logic of fallacious
reasoning on the \textit{EAUI}-conception would have to focus on the four defining
conditions of it: error, attractiveness, universality and incorrigibility. I sug-
gested that one explanation of why the Eighteen appear to satisfy the last
three of these conditions can be set out as follows. For individual reasoners,
the Eighteen are either not errors, or if they are, are not typically committed
by beings like us. It is possible, of course, that for institutional agents, who
have the resources to meet targets of considerable loftiness, at least some of
the Eighteen are indeed errors. This helps explain why the Eight \textit{appear} to
be fallacies. They appear to be errors because they are errors for institutional
agents. They are attractive because they are not errors for us or not errors
that we typically commit. They are attractive to us for the same reason. They
are universal because evolution has kitted us out to reason similarly in sim-
ilar situations. And they are incorrigible because they present nothing that
requires correction or across the board suppression.

Attractive though the suggestion may have seemed initially, it is doubtful
that we can now persist with it. Consider the following two examples of institu-
tional agency. Let \(M\) be the community of number theorists since, say, 1900.

\(^2\) As [51] points out, sometimes a more efficient way to learn is to make “natural”
mistakes which admit of speedy and reliable correction.
Let $E$ be the community of experimental and statistical scientists since that same year. It is clear that truth-preservation is a dominant target in $M$ and that validity is an attainment-standard. Similarly, the target of experimental confirmation is dominantly present in $E$ and with it, the standard of inductive strength. Consider now the traditional fallacies of affirming the consequent and denying the antecedent, each plainly an invalid bit of reasoning. If, as in $M$, truth-preservation is the target, then these would be errors in $M$. But are they fallacies? One could hardly think so. These are not mistakes that are committed in $M$ with anything like the frequency required to make them fallacies. Nor are they attractive or incorrigible in $M$. So again they can’t be fallacies. Mathematicians make mistakes. But they don’t make those mistakes.

Much the same must be said of the so-called inductive fallacies – e.g., hasty generalization, post hoc ergo propter hoc and the gambler’s fallacy. These are errors only in relation to the target of experimental confirmation or probabilistic projection. $E$ is an institutional agent for which this is a dominant standard. Although these are errors in $E$, they are not fallacies. Scientists don’t commit them with any frequency to speak of. They are not attractive and not incorrigible to scientists in their white coat moments. Scientists make mistakes. But they don’t make those mistakes.

This leaves the Gang of Eighteen in pretty forlorn shape. We are having a difficult time in finding agents who commit them in fulfillment of the conditions that make them fallacies. This lends support to our earlier suggestion of a serious “radish problem” for the Eighteen on the $EAUI$-conception. We seek for an analysis of radishes but we channel our investigations to marshmallows. Not only do we not get radishes right, we also end up with a ludicrous theory of marshmallows. As regards the fallacies, this puts massive pressure on the Gang of Eighteen or the $EAUI$-conception, or both. If we assume that the $EAUI$-definition is sound, we must be ready for the possibility that the Eighteen aren’t in its extension (which is precisely the purport of the negative thesis). On the other hand, perhaps the $EAUI$-conception itself is where the problem lies. Perhaps it is the case not only that the Eighteen don’t satisfy the four $EAUI$-conditions, but also that nothing does. I am not ready at present to assert as a fact that the concept of fallacy is empty. But I admit to being much drawn to the idea. It is an interesting possibility that does not merit dismissal out of hand.

There are, of course, some obvious objections to consider, beginning with fallibilism. Fallibilism is an epistemological doctrine which in all its variations honours the empirical fact that

**Error abundance.** Beings like us make errors, lots of them.

Of course, fallibilism is not scepticism. It does not purport that we are always mistaken. Indeed it honours the further fact that

**Knowledge abundance.** Beings like us have knowledge, lots of it.

On the face of it, the two abundance theses stand to one another in an uneasy tension. But that tension appears to dissipate, or anyhow to diminish,
once we throw the Enough Already Principle into the mix. Notwithstanding
that we commit lots of errors, these are not in the aggregate errors of sufficient
moment to deny us our collective survival and prosperity. We are right enough
enough of the time about enough of the right things. The point at hand is
this. If we commit lots of errors, then we do lots of things that appear not
to be errors. Moreover, fallibilists are not of the position that with human
individuals errors are just one-off miscues. Their view rather is that error is
persistent and recurrent in the human species. This is getting to be rather
close to satisfying the \(EAUI\)-conditions on fallacious reasoning. So might it
not be the case that although the Eighteen aren’t in the extension of the
\(EAUI\)-conception, lots of our other errors are? If so, would it not fall to
the fallacy theorist to seek out the identities of those errors, assigning them
suitable names and organizing them in appropriate taxonomies?\(^{23}\)

Granted that we commit errors on a grand scale, how might it come to
pass that there are no fallacies? I lack the space to consider this question with
the care and detail it deserves.\(^{24}\) But it is possible to sketch out a possible
answer, which strikes me as meriting a certain consideration. To that end, let
us repeat that the errors associated with the \(EAUI\)-conception of fallacies are
errors of reasoning – in particular, errors affecting inferences or the reaching
of conclusions.

1. Then the first thing to say is that most of our errors are not errors
of reasoning. Rather they are mechanical errors, perceptual errors, errors of
forgetfulness, errors arising from misinformation, and the like. Since these are
not errors of reasoning, the question of fallaciousness does not arise for them.

2. A second point has to do with the structure of defeasible reasoning.
Virtually everyone agrees that accepting a proposition \(\alpha\) is an error should
\(\alpha\) turn out to be false. Picking a false \(\alpha\) is “getting the wrong answer”. Yet
virtually everyone also believes that the inference pattern

\[
\begin{align*}
1. & \quad \alpha \\
2. & \quad \beta^{\text{def}}
\end{align*}
\]

in which \(\alpha\) is the premiss, \(\beta\) the conclusion and \(\beta^{\text{def}}\) is the defeasible therefore-
sign, is one which can be sound even though \(\alpha\) is true and \(\beta\) turns out to be
false. For concreteness let \(\alpha = \text{“Ocelots are four-legged”}\) and \(\beta = \text{“Ozzie the}
ocelot is four-legged”\). Let it be the case that, as before, Ozzie is in fact three-
legged. The qualification “def” on \(\beta\) indicates that \(\beta\) is a default drawn from
the generic \(\alpha\). It is a good inference, even though it is not truth-preserving. It
is a good inference even though its conclusion chances to be false, and even
though it is an inference that would have to be given up once this fact came to
light. This reminds us that, as long as \(\beta\)’s falsity is not known to him, an agent
might reasonably conclude it from a true \(\alpha\) by defeasible inference. When he
does so defeasibly, drawing that default is \text{not} an error of reasoning, although

\(^{23}\) For example, what of the conjunction fallacy of Kahneman and Tversky? For
arguments that this, too, is not fallacy, see [43] and [52].

\(^{24}\) This is undertaken in [53].
persisting with it once β's falsity became known would be a mistake. We draw default inferences with great frequency, almost as naturally as we breathe. In lots of these cases, we make a mistake, the mistake, namely, of "picking a β that is the wrong answer". But in so doing, we have not committed an error in reasoning. So here too is a large class of cases in which the error we commit is not even a candidate for fallaciousness.

Needless to say, defeasible inference is not alone in allowing for the possibility of reasoning correctly to a false conclusion. Inductive inference has the same feature. Consider a simplified schema.

1. Pr (P) = n
2. Evidence E exists.
3. Pr (P/E) = n + m (for suitably high n and m)
Therefore, P
Or, in an assertoric variation,
4. Therefore, probably P.

Here it is understood that assertorically modified or not, the inference to P requires only a suitable degree of inductive strength, and that this strength is present when the values of n and m are high enough. But nowhere is it required for the inference to be inductively sound that P be true. One can be right in the inference one draws and yet also, in picking P, get the wrong answer.

Much the same is true of abductive reasoning. Consider another simplified schema. Let T be an explanation-target that an agent X cannot attain on the basis of what he now knows (K). Assume further that X lacks the wherewithal to repair his ignorance in a timely way, and yet he wishes his ignorance not to paralyze actions of the kind that T-attainment would provide a basis for. Suppose also that a proposition H, whose truth-value is not known to X, is such that, were it true, then K updated by H would explain T. Then, X abduces H in two steps. First, he conjectures that H. Secondly, on that basis, he activates H; that is, he releases it for premissory work in inferences and decisions relevant to his interest in T in the first place. Summarizing,

K doesn’t attain T.
If H were true, K(H) would attain T.
Therefore, H is a reasonable conjecture.
Therefore, H.

As with the other cases, the therefore-operator is not intended to be truth-preserving, nor as with inductive inference, need it here be probability-enhancing. Abductive inference is typically weaker than that. But the main point remains untouched. A reasonable abduction of H is compatible with H’s falsity.

Defeasible and abductive inference dominates the reasoning of the ordinary individual. They both allow for the compatibility of good reasoning and false

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25 For a reminder of the use of “probably” as an assertion-modifier see [54].
26 For more detailed examinations of abduction, see [55], [37], [56] and [57].
conclusions. Although individuals avail themselves of it less, inductive reasoning has the same character. This tells us something of the first importance. Let $f$ be the frequency with which we reason reasonably to false conclusions, that is, with which we reason in an error-free way to an error. The higher the value of $f$, the greater the likelihood that the Error Abundance Thesis is confirmed by errors that aren’t errors of reasoning. Everything that we so far know about these things suggests that as a matter of fact the value of $f$ is rather high. Accordingly, 

*The unlikelihood of fallacy.* The likelihood is high that the errors that lend greatest confirmation to the Error Abundance Hypothesis are not errors of a type that qualify as fallacies.

(3) We come now to a third point. Let $\Sigma$ be a set of priors, i.e., a database, a set of given facts, a knowledge-base, a set of premisses, or some such thing. Things like $\Sigma$ we happen upon endlessly as we make our way through the minutes and hours of our engagement with the world. In a rough and ready way, we can note that these $\Sigma$s are informative for us in two ways. They carry information directly (by way of “what the facts say”) and they convey information by inference (by way of “what the facts mean”). When his $\Sigma$s bears on him relevantly, a cognitively competent individual will have a generally good track-record discerning the information that $\Sigma$ carries, as well as the information that can be inferred from it. Clearly there are variations within these competencies; and, in extremis, they may break down. Consider the case in which an agent is reasonably good at reading what a $\Sigma$ says, but no good at all at discerning what it means, that is, what should be inferred from it. What we see here is the absence of reasoning rather than bad reasoning. The person who doesn’t know what to make of his $\Sigma$s is in a bad way. There is something wrong with his reasoning skills. There is a deficit of reasoning here, a failure of reasoning. But it would be going too far to call it an error. Of course, it is vacuously true to say that this is error-free reasoning, but there is no comfort in saying so. What we learn from this is that there is more to learn about deficiencies of reasoning than can be found in any theory of reasoning-errors, or in any theory that requires fallacies to be errors of reasoning.

We now have the means to say that in their failure to engage the factor of error in a robust way, theories of agent-based reasoning are asking for trouble, and theories of fallacious reasoning are guaranteed to get it.\(^{27}\) For the present, it may be that we have now said enough to lend some support to the conjecture of several paragraphs ago.

*No fallacies.* When our errors are *bona fide* errors of reasoning, they occur with neither the frequency, the attractiveness, nor incorrigibility required to qualify them as fallacies of any kind on the EAUI-conception. More briefly, there are no such fallacies.

\(^{27}\) A first attempt at subduing the concept error may be found in [Woods, 2007a]. Also relevant, in addition to [Woods, 2007b], are [Woods, 2007c], and [Woods, 2007e].
I do not say that the thesis of the emptiness of the EAUI-concept is now
\emph{fait accompli}. Even so, it now enjoys some backing of non-trivial weight. If the
thesis is right, it leaves fallacy theory in considerable disarray. If so, there is a
biting irony to it. As I mentioned in section 5, for years I have complained that
jettisoning the traditional concept of fallacy by pragma-dialecticians, in favour
of a stipulated successor that dances to the provisions of their preferred theory
of argument, was solving an honourable and difficult problem by changing
the subject. If, as pragma-dialecticians say, a fallacy is any deviation from a
rule of civilized discourse, then fallacy theory is no more difficult than the
problem of specifying those rules.\footnote{Even this is harder than it may first appear.}
My position all along has been that the
pragma-dialectical solution of the fallacies problem has, in Russell’s words
about another thing, all the virtues of theft over honest toil. But if, as I
now conjecture, the traditional concept of fallacy is indeed empty, it is much
harder to persist with one’s dissatisfactions with the Amsterdam School. Of
course, it by no means follows from the emptiness of the EAUI-concept, that
fallacies must be conceptualized in the Amsterdam way. There are two rival
possibilities to keep in mind. Either fallacies are properly conceptualizable,
but not in the Amsterdam way. Or fallacies are like phlogiston. The trouble
with phlogiston was not that it was misconceived. It was that there wasn’t
any. The concept “phlogiston” was empty. No one thinks on that account that
we must now find an extension for it by getting it to mean something different.

All this, of course, is rather tentative – one might even say “defeasible”.
One thing is clear, however, the fallacies project is still a wide-open question
for the logical theory of the 21\textsuperscript{st} century.

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