What types of arguments are there?

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ABSTRACT: Our typology is based on two ground adequacy factors, one logical and one epistemic. Logically, the step from premises to conclusion may be conclusive or only *ceteris paribus*. Epistemically, warrants may be backed *a priori* or *a posteriori*. Hence there are four types of arguments: conclusive *a priori*, defeasible *a priori*, defeasible *a posteriori*, and *prima facie* conclusive *a posteriori*. We shall give an example of each and compare our scheme with other typologies.

KEYWORDS: analytic, *a posteriori*, *a priori*, backing, *ceteris paribus*, conclusive, defeasible, synthetic, warrant

1. SOME PROPOSED ANSWERS

No doubt, the most hackneyed answer to this question is deductive and inductive, where these two types are understood to be exhaustive of the entire class of arguments. But almost from the very beginning of the scholarly study of informal logic, this answer has been challenged. Govier (1980) introduced the informal logic community to Wellman's conductive arguments, introduced in (1971), understood to be neither deductive nor inductive.[1] Wellman did not stop at recognizing just three types of arguments, but regarded some reasoning involving statistical or probability inference, reasoning from data to an explanatory hypothesis and, unless it can be reduced to statistical inference, arguments by analogy as further distinct types of arguments. (See Wellman, 1971, p. 52.) But Wellman was not the first to argue that there was an additional type of argument besides deductive and inductive. Peirce in (Peirce, 1955, pp. 150-56) advocated abductive as a further type. Nor have Peirce and Wellman be the last to advocate some further type of arguments or a different typology. Van Eemeren and Grootendorst in (Van Eemeren and Grootendorst, 1992, pp. 96-97) identify three basic categories of argumentation schemes: argument from sign or symptomatic arguments, argument from similarity (by analogy), and instrumental or causal arguments. Kienpointner in (1992) identifies arguments to a warrant, from a warrant, by analogy, and from authority as four basic types. He further allows for a number of subdivisions of arguments to or from warrants. Discussing his typology *vis-a-vis* the one we present here requires a paper in its own right. Walton (1996) identifies twenty-six argumentation schemes.

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[1] Govier had even previously sent the editors of *The Informal Logic Newsletter* a notice about Wellman's conductive arguments. (Govier, 1978, p. 4).

Walton, Reed, and Macagno (2008) identify over eighty schemes, and the number recognized may still be rising. This proliferation of argument types may not be as alarming as might seem. In (1996) Walton regards instances of the schemes identified there as instances of presumptive reasoning, a type of reasoning he regards as distinct from both deductive and inductive reasoning. If we picture argumentation as occurring in dialogue between a proponent and challenger, presenting a presumption at a given point in the dialogue will shift the burden of proof at that point from one side to the other. These schemes then are not *sui generis* types of arguments. Rather, they are to presumptive reasoning as inference rules are to deductive reasoning arguments–patterns of argument to be evaluated by general standards for presumptive reliability as arguments instancing inference rules are to be evaluated for deductive validity. So perhaps it is not unfair to say that at least in (1996), Walton recognizes three basic types of arguments: deductive, inductive, and presumptive.

2. OUR PROPOSAL

In light of these differing typologies, may we give an account of the basic types of arguments which "cuts nature at the joints," identifying those types which need to be evaluated differently or through different considerations? Recall that any argument, except a blatant *non sequitur*, involves an assumption of some general connection between the premise or premises and the conclusion. We may phrase this connection as an inference rule (formal or material) or as a universally generalized conditional. Such general assumptions are the warrants in Toulmin's model. Now as Toulmin has reminded us, some warrants may claim that we can step from premises to conclusion unconditionally or without exception. 'All F's are G's,' where 'all' really means all. These are conclusive warrants. Arguments instancing these warrants, so long as they are deductively valid, are likewise conclusive. In other cases, we may make the step tentatively, only with reservation. 'Usually, typically, *ceteris paribus* F's are G's.' These are defeasible warrants. So we may divide the class of warrants into conclusive and defeasible.

These considerations lead directly to a further dichotomous division of warrants which we must recognize. As Toulmin has taught us, one may identify the warrant of an argument yet still question its reliability as a leading principle of reasoning. What is its "authority or currency" (Toulmin, 1958, p. 103)? This question raises the issue of backing. Toulmin is emphatic that warrants may be backed in many different ways, depending in his view on the field of the argument. In (Toulmin, 1958, p. 104), he cites six different fields–taxonomy, law, statistical reports, morals, mathematics, and psychology–to illustrate that warrants are backed in different ways or by different considerations. In (Freeman, 2005), we proposed replacing the field classification of warrants with an epistemic classification, based on recognizing types of intuition. We want to propose here an even simpler epistemic distinction. Warrants (thought of either as inference rules or their associated generalized conditionals) may be backed either *a priori* or *a posteriori*. Let us make clear that we are making this distinction on whether the backing evidence for the warrant involves sense experience or not. Statements true by virtue

of their logical form or semantic meaning of certain component expressions are knowable *a priori*. In addition, we follow Ross (1930) in including basic evaluative generalizations, e.g. 'Anyone who makes a promise has a duty to keep that promise' as knowable *a priori*. If the associated generalized conditional is knowable *a priori*, the warrant thought of as an inference rule is backed *a priori*. Likewise, if the associated generalized conditional is known only *a posteriori*, the warrant is backed *a posteriori*.

Our two distinct dichotomous classifications of warrants cut across each other to produce a fourfold classification of warrants and thus of arguments as shown in table 1:

	conclusive	defeasible
a priori	conclusive *a priori* warrants	defeasible *a priori* warrants
a posteriori	*prima facie* conclusive *a posteriori* warrants	defeasible *a posteriori* warrants

Table 1

We hold that this classification is not just abstract but that each of these classes are non-empty. Although the claim that there are conclusive *a priori* warrants and defeasible *a posteriori* warrants is commonplace, we expect that our claim that there are defeasible *a priori* warrants and, *a fortiori prima facie* conclusive *a posteriori* warrants many will find distinctly controversial. We shall defend these points in due course and present examples.

We hold that this fourfold classification of warrants and thus also of arguments is necessary for properly evaluating ground adequacy, because we regard the factors on which ground adequacy depends as different in each case. To attempt to devise a "one size fits all" criterion for ground adequacy is a philosophical mistake. We hope that the ensuing discussion will make this claim plain. Note at this point that it should be understandable why we believe there can be defeasible arguments which are not inductive. Should the warrant be defeasible *a priori*, it is not backed by empirical evidence pertaining to particulars, whereas a warrant corresponding to an inductively supported generalization, for example, will require such evidence.

3. TYPES OF ARGUMENTS AND ASSESSING GROUND ADEQUACY

Appreciating that assessing ground adequacy requires different considerations for each of the four types of warrant and the arguments instantiating them should be straightforward. If the argument is conclusive, then if one can produce a

counterexample to its warrant (or the associated generalized conditional of the warrant), the premises fail to give grounds adequate for the conclusion. But if the argument is defeasible, such a counterexample may be completely beside the point. If an argument is backed *a posteriori*, ground adequacy may depend on the extent and variety of the empirical backing for the warrant, i.e. the empirical evidence for its associated generalization. But, although the argument that one has a duty to keep a promise, given that one has made the promise, may be defeated in some circumstances, one does not come to regard the claim that promises entail moral obligations acceptable through taking an empirical survey. Since it is straightforward that some warrants are conclusive *a priori* (just consider any instance of a formally valid inference rule[2]) and other warrants defeasible *a posteriori* (consider any warrant whose associated generalization is an established causal generalization although with admitted exceptions), our burden of proof concerns showing that the classes of defeasible *a priori* and *prima facie* conclusive *a posteriori* warrants are not empty.

3.1 *Are there defeasible a priori warrants?*

That evaluative properties are consequent or supervenient upon value making properties is commonplace. Consider the following warrants:

From:	*x* made a promise (to *y*) to do *A*.
To infer:	*x* has a duty to do *A*.
From:	*y* has done a service for *x*
To infer:	*x* has a duty to pay *y*.

Associated with these warrants are the universal generalizations

Anyone who promises some other person to perform some action has
a duty to perform that action.
Anyone for whom someone has done a service has a duty to repay that
person.

Recognizing the *ceteris paribus* reliability of these warrants or the *ceteris paribus* truth of the corresponding generalizations is *a priori*. For us, Ross's argument is persuasive:

> To me it seems as self-evident as anything could be, that to make a promise ... is to create a moral claim on us in someone else. Many ... will perhaps say that they do *not* know this to be true. If so, I certainly cannot prove it to them; I can only ask them to

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[2] Hitchcock has shown in (1998) how the problem of the paradoxes of relevance for classical logic may be avoided by modifying the classical notion of validity. An inference rule will be valid just in case it is not only impossible for an instance of its premises to be all true and its conclusion false, but it is also possible for all of its premises to be true together and it is possible for its conclusion to be false. This rules out the paradoxes connected with inconsistent premises and necessarily true conclusions. See (Hitchcock, 1998, pp. 24-27).

> reflect again, in the hope that they will ultimately agree that they also know it to be true. (Ross, 1930, p. 21n)

Ross holds that one learns general principles of duty in a way parallel to learning basic mathematical truths. We recognize instances of putting two and two distinct elements together and getting four. By reflection, we apprehend the general computational principle. In the deontic case, we see the rightness of keeping promises in several instances–if we make a promise we sense an obligation to keep it or sense that our not keeping it without sufficient justification would be a moral failure on our part. By reflection, we recognize the general connection.

If these principles are self-evident, cannot one challenge why they are synthetic and not analytic? Do we not see that incurring the duty of promise keeping is simply part of the meaning of making a promise or having a duty to repay is part of the very meaning of receiving a service? To see that these associated generalizations are not analytic, just consider that there are exceptions to keeping a promise–in a conflict of duties where the promise is outweighed by some more stringent duty. Likewise there are exceptions to whether someone should pay for a service when rendered, certainly if the service is unsatisfactory. Likewise, the corresponding warrants are not conclusive. But if the generalizations were analytic, true by virtue of the meaning of making a promise or rendering a service, this would not be possible. The statements would be necessarily true by virtue of the meaning of their component terms.

These considerations present the reasons why we count these warrants as defeasible and not conclusive. To state the warrant properly, one should insert '*ceteris paribus*' immediately after the 'To infer.' Saying that someone has made a promise is to make a descriptive claim about that person's communicative behavior. Should that person claim he had no obligation to keep his promise and refuse to keep it, we would judge that behavior wrong. But if having such an obligation were part of the very meaning of making a promise, the person would not be acting wrongly in denying the obligation. He would not have made a promise to begin with, either because he never intended to carry out the commitment his communication would ordinarily be understood to entail or because he did not understand that communication to begin with. To say that promise breaking is wrong is to judge acts describable in a certain way. But it is not logically absurd to admit that there are exceptions and that the generalization should be qualified by a '*ceteris paribus*' clause. But if 'being wrong' is part of the very meaning of 'promise breaking,' such a claim *is* absurd. If the acts were not wrong, they would not be instances of promise breaking to begin with. The analytic proposition is logically unassailable but trivial. The deontic judgment is neither. This shows they are two different judgments.[3]

In regarding these warrants and their associated generalizations as defeasible, we are taking a close but nonetheless different analysis from that of Ross. He introduced the notion of a *prima facie* duty, "an act which would be a duty proper if it were not at the same time of another kind which is morally significant" (Ross, 1930, p. 19). For Ross, the argument that an act is a *prima facie* duty given that it has

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[3] Compare Harrison's argument in (Harrison, 1967, pp. 71-72).

a deontically relevant property is conclusive. Whether an act is an actual duty depends on all the deontic properties it has, both positively and negatively relevant, and is defeasible. By contrast, Rawls (1971) regards the qualifiers '*prima facie*' or '*ceteris paribus*' as expressing "a relation between sentences, a relation between a judgment and its grounds; or as I have put it above, they express a relation between a judgment and a part or the whole of the system of principles that defines its grounds" (Rawls, 1971, pp. 341-42). We are following Rawls' analysis rather than that of Ross. For one thing, we do not have to postulate a category of *prima facie* duties. We have deontically relevant properties and duties proper. For another, qualifying 'To infer' in a candid statement of a deontic inference rule with "*ceteris paribus*" treats that expression as a modal qualifier which indicates that the warrant authorizes a tentative step from premise to conclusion, i.e. that the step is defeasible. But to indicate whether a step is conclusive or defeasible is exactly what a modal qualifier should do.

So far, we have carried out our discussion of whether there are defeasible *a priori* warrants in the framework of deontic warrants and arguments. But there are at least two other types of moral value–intrinsic and aretaic.[4] Again in both, ascriptions of value are consequent upon evaluatively relevant properties. Are the warrants of these arguments also defeasible *a priori*? It should be straightforward to see that they are.

> Eating ice cream is good because it is enjoyable.
> Mother Theresa was a morally good woman because she committed
> her life to relieving human suffering.

What are the warrants here?

From:	x is a pleasurable experience
To infer *ceteris paribus*:	x is intrinsically good
From:	x is committed to relieving suffering
To infer *ceteris paribus*:	x is morally good or virtuous

In both cases, the connection is synthetic. Being pleasurable does not mean that something is intrinsically good nor does being committed relieving to human suffering mean that someone is morally good. In both cases, the step can be defeated. Something might be pleasurable but quite bad, given its other properties. Someone might be a friend to the poor, yet aid them as a means of self-aggrandizement or with means gotten by extortion. The warrant is defeasible. But one does not determine that pleasure is typically good through a survey nor that commitment to the poor is correlated with being virtuous. One recognizes these propositions *a priori*.

We trust that this suffices to show that there are arguments with defeasible *a priori* warrants. But are the only members of this class evaluative arguments, where

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[4] Of course, there is also aesthetic and other kinds of value.

from premises predicating one or more evaluatively relevant properties we conclude to an evaluative conclusion? Clearly, those arguments which Govier has identified as *a priori* analogies have defeasible *a priori* warrants. Such arguments compare an actual primary subject with an analogue, constructed in imagination, to be similar to the primary subject by sharing certain properties. It should be clear that the analogue has some further property by virtue of instancing these similarities. At least in many cases, this is a synthetic *a priori* judgment. In many cases, the similarities argued from may be evaluatively relevant and the conclusion an evaluative statement, but not necessarily all. We may be trying to argue that the primary subject has some property which is more or less intuitively understood, a matter of family resemblances rather than of clear cut conceptual definition. In discussing Wisdom's notion of case-by-case reasoning, Govier points out that such arguments may concern whether some entity is a nation or a mobile home (Govier, 1987, p. 57). As she elaborates, "Questions about the correct application of such terms as 'solid', 'negligence', 'nation', 'race', 'solvent', and many others are not purely verbal" (Govier, 1987, p. 57). If they were purely verbal, we could explain disagreements by how the parties had previously used these terms.

> However, in a case where two people are disagreeing on a significant conceptual issue, such as whether anything is really solid, in the light of particle physics, this disagreement ... is a difference as to the correct decision about how the term should be used in the future, given significant new data. Nor is the difference between them a factual one, for it will not be resolved by future observations. ... Here, the issue is one that requires decision, not prediction. (Govier, 1987, p, 57)

Such arguments are defeasible. The primary subject could easily have some further property or properties which defeat the similarities argued from in showing the primary subject has the similarity argued for. The warrant of the argument is *a priori*. By including as premises that the analogue has both the similarities argued from and the similarity argued for, the argument is attempting to illustrate a connection between these properties, to let the challenger "see" the warrant *a priori* through this illustration of a conceptual connection as one might come to "see" *a priori* certain elementary arithmetic truths through illustration. Notice that *a priori* analogies cannot be reduced to a form of statistical inference, confirming Wellman's expectation that these arguments by analogy at least are neither deductive nor inductive.

What may we say of explanatory reasoning, i.e. Peirce's abductive reasoning or reasoning to the best explanation? As Govier points out in (2010), we are entering an area of disagreement among philosophers and logicians. Hence, we shall attempt no more than to argue that Wellman's conjecture that such arguments are neither deductive nor inductive is plausible together with the claim that the warrants of such arguments are defeasible *a priori*. Adapting Govier's discussion in (2010), we may schematize such arguments this way:

1. Event E has occurred.
2. Hypothesis H1 explains E (i.e. if H1 were the case, we would expect E (at least E would be distinctly probable).

3.   H1 is the best available explanation of E.
Therefore, *ceteris paribus*,
4.   H1

Such arguments are clearly defeasible. H1, ..., Hn may constitute the recognized class of explanations for E (at least those with significant plausibility to be taken into account). But there could be some further explanation H*, not yet recognized, which would prove better than any of H1, ..., Hn. Should it be recognized, all things would not be equal.

Taking the schema as the warrant, would one go about trying to back it by gathering a statistical sample of evidence? Alternatively, what reason might one seek for the proposition:

Ceteris paribus, when H1 explains E and is the best recognized explanation for E of those recognized, then H1.

I do not believe we can answer this question until we explicate what 'best explanation' means. Again, let us assume that H1, ..., Hn are the recognized explanations. Clearly, we might expect that if H1 were the best explanation, $Pr(E/H1) > Pr(E/Hi)$, $2 \leq i \leq n$. We would also expect that $Pr(E/H1) > .5$, indeed significantly greater than .5. (Otherwise, H1 would not be much of an explanation for E.) Hence, we might propose, at least as an approximation, rewriting the warrant this way:

1.   Event E has occurred.
2. $Pr(E/H1) = .r > .5$.
3. $Pr(E/H1) > Pr(E/Hi)$, $2 \leq i \leq n$.
Therefore, *ceteris paribus*
4.   H1

Viewed in this way, the warrant incorporates the *prime principle of confirmation* or the Likelihood Principle: "Observation O supports hypothesis H1 more than it supports H2 if and only if $Pr(O/H1) > Pr(O/H2)$." (Sober, 2004, p. 100) So at least part of what it means for H1 to be the best explanation for an event E is that H1 renders E more probable than any of its rival hypotheses. But a moment's reflection indicates that this is not a complete explication of "best explanation." An inference of this pattern would be easily defeated if H1 were an implausible hypothesis, i.e. its prior probability would be low. If one or more of its rivals had a distinctly higher prior probability, that hypothesis might be far better supported by the evidence E than H1, i.e. $Pr(Hi/E) > Pr(H1/E)$. Clearly, under such circumstances, we would regard the inference to H1 as defeated, even though $Pr(E/H1) > Pr(E/Hi)$, $2 \leq i \leq n$. We must add another premise to our schema:

1.   Event E has occurred.
2. $Pr(E/H1) = .r > .5$.
3. $Pr(E/H1) > Pr(E/Hi)$, $2 \leq i \leq n$.

4.   Pr(H1/E) > Pr(Hi/E), 2 ≤ i ≤ n.
Therefore, *ceteris paribus*,
5.   H1.

How would this inference be backed? Consider the associated generalization:

> All things being equal, where hypothesis H1 explains event E, the occurrence of E supports H1 over any of its acknowledged rival hypotheses (i.e. 3), H1 has a higher posterior probability than any of its acknowledged rivals (i.e. 4), then H1.

Do we need to undertake some statistical survey to establish the acceptability of this generalization or is it self-evident? If self-evident, then the associated generalization is synthetic *a priori* and the warrant is backed *a priori*. We offer these considerations to motivate why one might agree with Wellman that inferences to the best explanation are neither deductive nor inductive and further to motivate that this form of reasoning may be defeasible *a priori*.

3.2 *Are there prima facie conclusive a posteriori warrants?*

What may we say of the other controversial class of warrants under our classification? Are there any arguments which have *prima facie* conclusive *a posteriori* warrants? Suppose someone reasons according to the simple warrant

From: F*x*
To infer *ceteris paribus*:   G*x*

where a person offers statistics on a sample of F's showing a high proportion of them to be G's. Recognizing that two factors affect the reliability of the inference from the percentage of a sample of F's which are G's to the percentage of the population of F's is standard. These factors are the size of the sample and its representativeness. Where the percentage of our sample of F's which are G's is .y, calculating the probability that the percentage of the population of F's which are G's is within a certain interval of that percentage of the sample is a matter of the statistics of confidence intervals, and in part is a function of the size of the sample. In general, the larger the size, the higher the probability that sample frequency accurately reflects population frequency.

One would expect, then, that if the percentage of a sample of F's which were G's is high (e.g. 90 per cent) and if the probability that the percentage of the population of F's which are G's is within one per cent of this 90 per cent figure is duly high, e.g. Pr[.89 ≤ percentage in population ≤.91] = .95, then from the information that F*a* we can infer G*a* with a high degree of reliability. We would expect our warrant to transfer the acceptability from 'F*a*' to 'G*a*.' But this argument may be defeated. The element *a* might have some further property 'H,' where the percentage of those F's in our sample which are H's and also G's is very low and, with high probability so are the F's which are H's in the general population.

Suppose in examining our sample of F's that we were concerned just with determining the percentage of those which are also G's. Although we may recognize that there are certain relevant variables some of whose values might affect whether an F is also a G, we have not sought specifically to test whether any of these values are falsifying of the claim that generally F's are G's. In (1977), L. J. Cohen has proposed a method of canonical testing for determining to what extent an empirical generalization resists falsification through potential values of relevant variables. Suppose one has observed a constant co-variation of F's with G's, i.e. each observed F is also a G. Suppose one also recognizes a number of variables which could affect whether an F were a G, say n-1. So including being an F, we have n relevant variables. Now if we have observed just whether something is an F and found it always to be a G, our empirical generalization 'All F's are G's' has passed the first canonical test. The weight of our evidence is 1/n. Suppose we order the remaining relevant variables, and expose our F's to various potentially falsifying values of the second variable. Suppose further that in none of these cases does an F fail to be a G. So now our generalization has passed the second test. But intuitively because of the variety of our evidence, we have a weightier test than when we simply tested to see whether F's were G's. The weight of our evidence is 2/n. In like manner, we can test our generalization against potentially falsifying combinations of values of the third, fourth, theoretically up to the n-th relevant variable.

Suppose through all these canonical tests that F's invariably were G's. At the end of the test the weight of evidence is n/n. This result would be a limiting case of the method of canonical testing. Of course, it is logically possible that unrecognized relevant variables exist, some of whose values could falsify our generalization. Our canonical test has *not* shown that 'All F's are G's' is a logical truth. But Cohen claims, with plausibility, that it shows the generalization to be a law of nature. Surely we have a *prima facie* case that it is. By the same token we have a *prima facie* case that we can infer conclusively and not just *ceteris paribus* from *a*'s being F to *a*'s being G. The warrant is not hedged or qualified. It is conclusive, but backed *a posteriori*. We qualify that warrant as *prima facie* conclusive *a posteriori* to acknowledge our lack of omniscience. Out catalogue of relevant variables may be incomplete and our canonical test imperfect.

Cohen has presented a very straightforward example in his discussion of von Frisch's work on bees. Consider the following warrant:

From: *x* is a bee with normal (for bees) color perception.
To infer: *x* discriminates the color blue.

By omitting the *ceteris paribus* qualifier, we intend this warrant to be conclusive. How could it be justified? Observation of bees continually returning to a blue card which offered sugar water certainly would count as evidence. But could there be other explanations? If there were a finite number and each could be refuted, that refuting evidence would supplement the positive evidence supporting that bees discriminate the color blue and, as we shall see, for practical purposes would render the warrant conclusive. Suppose that other hypotheses include that the bees recognize shade of color, rather than color itself, or they recognize the card's

location relative to the surroundings, or the smell of the sugar water, or the fact that they are feeding.

These other hypotheses can be refuted through a canonical test. If the bees are responding to color shade, then if experimenters surround the blue card with other cards varying in shades of grey from white to black, one would expect the bees to proceed to some of these other cards. However they return just to the blue card. If the bees are responding to the relative location of the card, then rearrange all these cards at different locations. On the relative location hypothesis, we would expect the bees not to return to the moved blue card, but to some other card in the blue card's former relative location. But this does not happen. If the bees are responding to the smell of sugar water, then remove the smell by covering the card with glass. Yet the bees continue to return to the blue card. By showing that other plausible explanations fail, "the initial hypothesis is thought less and less open to reasonable doubt or query" (Cohen, 1977, p. 131). If *all* the competing hypotheses are ruled out (assuming the sample is sufficiently large), then is not the hypothesis confirmed beyond reasonable doubt? For all practical purposes cannot we omit the '*ceteris paribus*' qualifier for the corresponding warrant? If the evidence generated by a canonical test complete with respect to the currently recognized relevant variables shows no relevant variable falsifies the hypothesis, then we may take the hypothesis as completely confirmed and the corresponding warrant completely backed by the evidence. Of course, further relevant variables may be discovered, especially if disclosed by anomalies. That is why we regard the conclusiveness of such warrants as *prima facie*. Ultimately the warrant may prove defeasible. But given the completeness of the canonical test, until nature forces us to recognize such a variable, we may regard the warrant as conclusive.

I believe we may identify another class of *prima facie* conclusive *a posteriori* warrants. Toulmin indicates that some warrants may be backed by a system of taxonomical classification. Consider:

From: *x* is a whale
To infer: *x* is a mammal

Is this warrant defeasible (and thus stated elliptically) or conclusive? Is being a whale a feature of an animal which gives us good reason to think it is a mammal but which can be defeated under certain circumstances, or are whales invariably mammals? Surely it is the latter, but why? One answer is that 'All whales are mammals' (unqualified generalization) is a taxonomic truth or taxonomic generalization, where such generalizations are unqualified. As Hempel points out in (1965), "A classification ... divides a given set or class of objects into subclasses, ... defined by the specification of necessary and sufficient conditions of membership" (1965, pp. 137-38). So understood, a taxonomy divides up a universe of discourse into subclasses, defining each subclass by certain concepts. The inference

From: *x* is a member of the subclass
To infer: *x* has a defining property of that subclass

is certain, not defeasible.

One might object that the connection between a class term and one of the concept terms defining it is analytic and thus not *a posteriori*. But this objection is not warranted. A system of taxonomy does not rest on *a priori* conceptual analysis. Rather, it seeks to construct a system of classification based on specific empirical evidence. As Hempel points out, science seeks for objective knowledge. Such knowledge requires intersubjective agreement among investigators, which in turn "requires that the terms used in formulating scientific statements have clearly specified meanings and be understood in the same sense by all who use them" (Hempel, 1965, p. 141). Operational definitions, specifying a publically repeatable testing procedure and a specific outcome, constitute one way of providing terms with intersubjectively constant meanings. Devising such definitions and testing them for reliability–Does the same observer judge the same case the same way on different occasions? Do several observers judge the case the same way?–is clearly not an *a priori* exercise.

Our challenger may still protest. The properties 'Fx' and 'Gx' may be operationally defined. But how does one come to recognize that there is a conclusive connection between being F and being G, that G's are a subclass of F's, thus backing the inference

From: Fx
To infer   Gx

This involves what Hempel calls the *systematic import* of a scientific concept. In a classification of F's as G's, "Those characteristics of the elements which serve as criteria of membership in a given class are associated, universally or with high probability, with more or less extensive clusters of other characteristics" (Hempel, 1965, pp. 146-47). Having scientific import means that the characteristics defining the classification have explanatory or predictive connections with other characteristics. But how are such explanatory or predictive connections recognized and justified? Surely it is not by *a priori* conceptual analysis but by *a posteriori* research.

4. COMPARISON WITH OTHER TYPOLOGIES

Let us take stock of our typology as presented thus far. We have proposed that there are four basic types of arguments–conclusive *a priori*, defeasible *a priori*, defeasible *a posteriori*, and *prima facie* conclusive *a posteriori*. We have argued that each of these four types is non-empty. Now if the conclusive/defeasible dichotomy is exhaustive, and the *a priori/a posteriori* distinction is exhaustive, and these classes are mutually exclusive, then any argument should find a unique place in our scheme. However, arguments which are classed together on one scheme may be assigned to different types on our scheme. This is especially true of Wellman's conductive arguments. In (1971), Wellman specifically says that not all conductive arguments concern ethical issues.

> Whenever some descriptive predicate is ascribed on the basis of a family resemblance conductive reasoning takes place. In all such cases there are several criteria for the application of the term and each of these criteria may be satisfied to a greater or lesser degree and they may vary in importance as well. The fact that one or more of the criteria are satisfied in a particular instance is a reason for applying the term, but the inference is nonconclusive. (Wellman, 1971, p. 54)

Consider this example which Wellman cites:

> Bees can communicate information about the location of flowers to other bees. Therefore bees have a language.

Here is the warrant:

From:	X's can communicate information about the location of flowers to other X's.
To infer *ceteris paribus*:	X's have a language.

How is this warrant backed? Clearly the important thing is not that the information is about flowers but that information gets communicated. Hence one may view the warrant as a special case of

From:	X's can communicate information to other X's
To infer *ceteris paribus*:	X's have a language.

How is this warrant backed? Why should one think that communicating with other members of one's species entitles one to say that the species has a language? Does not our experience as language users tell us that communication involves language of some sort? The argument is ultimately backed *a posteriori*. So although this argument may share the structure of conductive ethical arguments, the backing of its warrant and thus what counts for ground adequacy puts it into a different class from ethical arguments.

Govier gives an even clearer example of a conductive argument whose warrant is backed *a posteriori*:

> My husband and I drive 350 miles every week to get to our house in the country. In winter we buy fruits and vegetables trucked east from California. I use a lot of paper which requires felling trees. Therefore, my lifestyle involves wasting some energy.

(Paraphrase of an argument be Trebbe Johnson. See Gover, 1999, pp. 161-62.) In this argument, clearly each premise gives an empirical reason for the conclusion. Thus each step is backed *a posteriori*.

Arguments instancing one of van Eemeren and Grootendorst's three basic schemes–from sign, from similarity, or from cause–can straightforwardly be accommodated in our typology, although again instances of the same scheme may

be located in different types of arguments. In symptomatic argumentation, the premise is somehow presented as a sign of the conclusion.

> The frequency of road signs for Amsterdam is increasing. So we may expect that we are getting close to Amsterdam.

| From: | The frequency of road signs for location x is increasing. |
| To infer *ceteris paribus*: | We are getting close to x |

Clearly the corresponding generalization is empirical. Would not our (collective) experience constitute confirming evidence for this generalization–alternatively back this warrant? Of course, the number of road signs from Amsterdam might be increasing for some other reason. The warrant is defeasible *a posteriori*. By contrast,

> Smith's carelessly cutting down the tree allowed it to fall, damaging Jones' front porch. Therefore Smith has a duty to pay for repairs to Jones' front porch.

That certain acts are morally required should one damage someone else's property is a duty of reparation. Now it may be that Jones' front porch was so dilapidated that Smith was actually doing him a favor by getting rid of it. The warrant is defeasible but, as we have argued, we recognize the connection of certain acts with consequent duties *a priori*.

Arguments instancing the scheme of similarity are arguments by analogy, which we have already discussed as having some instances where the warrant is defeasible *a priori* and others where it is defeasible *a posteriori*. Finally, arguments from a cause have warrants corresponding to some causal generalization:

> The glass on the table has just been filled with ice water. Therefore, moisture will soon form on the outside of the glass.

As Nagel might point out, this argument assumes the causal generalization "Water vapor in air is in general precipitated as a liquid whenever the air comes into contact with a sufficiently cold surface" (Nagel, 1961, p. 16). Here again we have a generalization supported by confirming instances. The warrant is backed *a posteriori*, and situations might be varied so that condensation does not occur. The warrant is defeasible. Hence, arguments falling under any of van Eemeren and Grootendorst's three schemes find a place in our typology, although not all arguments falling under one scheme will fall under the same type.

With these considerations, we have made our case for our four-fold typology of arguments, that the four types are mutually exclusive and exhaustive of the class of arguments, and that arguments of various types recognized under other schemes of classification find a place within ours. Why is the classification of arguments important for the issue of connection adequacy? We hold that whether or not the premisses and conclusion of an argument are connected so that the acceptability of

the premises is transferred to the conclusion is determined differently for each of the four types of argument we have identified. We believe it is a major error to seek one criterion of ground adequacy or method for assessing it, as if generic conditions could be set down for the concept. We shall not attempt to prove that claim in this paper. We intend to show it correct in future contributions to the discussion.

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