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William Keith
University of Wisconsin-Milwaukee

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WILLIAM KEITH

Department of Communication
University of Wisconsin-Milwaukee
Milwaukee, WI 53201
wmkeith@uwm.edu

ABSTRACT: While the nature of warrants is unclear in both Toulmin's *Uses of Argument* and in textbook pedagogy based on it, the theory of non-monotonic reasoning could clarify and enhance our understanding of warrants.

KEY WORDS: Toulmin, warrants, non-monotonic reasoning, defaults, probability

INTRODUCTION

There is no question that *The Uses of Argument* is a significant and important book, and not only for the influence of the 'Toulmin model', but in its own right. However, not all of those who use the model, or profess to be working from Toulmin's perspective, have questioned deeply or productively some of the assumptions in his work. The best way to honor Toulmin's contributions to argumentation theory would be to press hard on some of his key concepts, connecting them usefully with those from other disciplines. In this paper, I will briefly lay out some problems with the concept of warrant, and suggest that they can be partially resolved by resources from default logics.

PROBLEMS WITH WARRANTS

Argument, on virtually any model, is a *movement*, from reasons to claims. So Toulmin's account of that movement should be distinct from (say) a first-order predicate calculus account of argument. Two problems arise in trying to parse this distinction. First, while the model as typically interpreted in textbooks is a fill-in-the-blanks diagram, Toulmin's account is clearly intended to be a *procedural* account of argument, as an alternative to the usual formalization of reasoning. Some of the characteristics that make his account distinct might be blurred or hidden by the emphasis on diagrams. Second, the principle that allows movement (in classical logic this principle is represented by the material conditional) needs to be defined. Toulmin calls his principle a *warrant*, and makes clear that warrants are bounded by institutional and disciplinary constraints ('fields'). Unfortunately, it's not clear how, diagrammatically, one is to cash out warrants, since they end up looking either so general as to admit almost any conclusion, or specific enough, but looking like a conditional; in some cases treatments Toulmin model look, for a textbook reader, as if warrants are convertible with a *modus ponens* argument scheme.

The usual story about Toulmin (endorsed by supporters like Brockreide and Ehninger, 1960, as well as detractors like Casteneda, 1960) is that his book is an attempt to drive a wedge between argument and logic, for better or worse. His admirers (in Speech Communication) saw him as liberating the multiple possibilities of argumentation from the manacles of a simple-minded formalism, while detractors (in Philosophy) thought he had given up on a notion of

reason foundational to Western philosophy. I regard both camps as somewhat mistaken. While the reigning conception of logic at the time was the first-order predicate calculus (FOPC), Toulmin oddly does not address his criticisms to it, instead focusing his attention on syllogisms. Certainly Lukasziewicz had recently shown (1952) that the FOPC was not only equivalent to but more powerful than the traditional syllogistic, but I suspect that if Toulmin had intended to undermine the sovereignty of the FOPC in particular (as Kripke later did, in a sense, in leading philosophers to believe that they needed to supplement it with modal logics), he would have done so explicitly. In a recent book, *Return to Reason* (2002), he most decidedly shows that he is a modernist, in a sense, just not an analytic philosopher but one who considers the FOPC too shallow a vessel to contain the richness of intellectual life.

Yet the fans of Toulmin are not quite right either. Toulmin does indeed deny that he's providing a new kind of logic, and he stresses a procedural account of argumentation; in his emphasis on procedure his continuity with Wittgenstein is most apparent. Unlike the transcendental sort of accounts offered by Wittgenstein (and later by Habermas), Toulmin's notion of procedure is firmly grounded in history, and in a particular institution (courts run on the lines of the English common-law tradition). So far, so good; clearly in setting the background for his account Toulmin is starting as far as he can from Frege: truth and representation play little or no role in his account (and choosing to work his changes on the syllogism only amplifies this distance). But there are still many features of his account that must give one pause: How much, exactly, has he given up on the traditional assumptions of logic? In particular, has he given up on the central property of deductive inference, that the entailment/implication relation is truth-preserving? We can find the answer, I think, by looking at his treatment of warrants, both in his own work and in the textbook accounts that flesh it out.

What are warrants, exactly? Let's look first at what they have become, in the world of pedagogy, and then look at how Toulmin originally characterized them. Authors, based on Toulmin's authority, consistently attribute three qualities to warrants. First, warrants link data and claims, typically through connection to substantive background information ('backing') that is relative to a field. Second, they are 'often' implicit, as opposed to the required explicitness of a formal argument, such as a syllogism, so they may have to be supplied by the interpreter of the argument. Third, their strength (or lack thereof) is transferred to the strength of the conclusion, as marked by the 'modal qualifier' attached to it, typically a sentential adjective of the familiar type: probably, possibility, almost certainly, etc. James Jasinski, in his *Sourcebook on Rhetoric*, claims that 'warrants function to authorize or validate the movement from data to claim' (27) and quotes from Anderson and Mortensen (1967):

> The warrant, unlike the invariant connective of formal logic, functions as a complex linguistic connective; i.e., it consists of substantive features of both data and claim while providing a lexical and structural link between propositional elements within the argument.

As an alternative to formal logic, then, warrants are supposed to provide a substantial, not merely formal, connection between data and claims. Brockreide and Ehninger, whose article and textbook introduced Toulmin to the Speech Communication field, say, rather confusingly, that:

> The function of the third element in a unit of proof, the *warrant*, is to determine whether the evidence is relevant to the claim and able to generate an inferential leap to it…The warrant is a set of criteria or general principles justifying a person in moving from evidence to claim. The warrant is dynamic and creative: It 'acts' rather than is 'acted upon', is 'method' rather than 'substance.' (p. 43)

How, one wants to know, does the warrant do all this? In point of fact, their examples (drawing on a hint from Toulmin) all introduced the logical role of the warrant with the word 'since', as in this example of a general warrant: '*Since* what is true of the above sample of examples is probably true of many other similar instances…' (p. 78) A worked-out example looks like this:

> Evidence: The price of raw petroleum has gone up…
> Warrant: *Since* higher costs of significant raw materials usually result in higher prices of finished (refined) goods…
> Reservation: *Unless* price controls are invoked /other costs in refining oil go down/ceilings are placed on profits in such industries/etc. …
> Qualifiers: Probably soon…
> Claim: The price of products made from petroleum will go up.

The warrant in this case seems to be (with qualifications) equivalent to 'if higher costs of raw materials, then higher prices of finished goods.' The presence of the qualifications doesn't seem to change its logical role in the argument, as a material conditional connecting the evidence and claim. Warnick and Inch (p. 165) give an inclusive account of warrants:

> *The warrant expresses the reasoning used to link the data to the claim.*… Warrants may take the form of rules, principles, or conventions particular to certain fields. Or they may be explicit statements of one of the patterns of reasoning … analogical, inductive, causal, sign and other types of relationships.

David Vancil, in his *Rhetoric and Argumentation*, gives a more straightforward account. He says that 'When warrants are very strong, they may take the form of rule statements, which look like these:

> If A is present, we can be sure that B is also.
> When the grounds A are in evidence, we can conclude that B is the case.' (p. 121)

It's hard to imagine what students are to make of such general explanations, so we must assume the clarification will come in the examples given. Most of the examples, however, look suspiciously like versions of modus ponens, as in this example:

> Grounds: My client was in San Francisco at the time the victim died.
> Warrant: A person in San Francisco cannot kill someone in Detroit.
> Claim: My client could not be guilty of murdering the victim in Detroit. (Vancil, p. 122)

Rieke and Sillars (1984) explicitly consider MPP to be a possibility; they call it 'argument from principle' (p. 71):

> Grounds: Socrates is a man.
> Warrant: All men are mortal.
> Claim: Socrates is mortal.
>
> Grounds: I am a free man.
> Warrant: All free men are citizens of Berlin.
> Claim: Ich bin [ein] Berliner.

But other examples don't look all that different:

> Grounds: Bob studied harder than Scott
> Warrant: Students who study harder get better grades.
> Claim: Bob will get a better grade than Scott. (p. 67)

In other cases, it's not clear what function the warrant is actually serving, since it seems like a little extra reasoning is necessary, even after the exposition of the argument:

> Grounds: Women are discriminated against
> Warrant: Discrimination is bad. Equality is good.
> Claim: Women must have equal status.

Doesn't this require a warrant about rejecting the bad and promoting the good? Despite what he says about warrants in *The Uses of Argument*, in his textbook Toulmin characterizes the 'support' for a warrant this way: 'Given facts of type F_1, F_2…F_n, one may draw such a conclusion as C' (p. 46). A student would have to be forgiven for mistaking this for a version of the material conditional, though an example on the next page ('smoke means fire') seems much richer in principle. Toulmin, Rieke and Janik (1979) also give the following example for a warrant in legal or ethical argument, surely a central case given the jurisprudential analogy at the heart of *The Uses of Argument*:

> Grounds: You left your car in a metered parking space without putting money in the meter.
> Warrant: Anyone who leaves a car in a metered parking space without putting money in the meter can be found guilty of an offence.
> Claim: You are liable to be found guilty of an offence. (p. 48)

Except for the gap between 'can be found guilty' and 'liable to be found guilty', this looks a lot like MPP. Warnick and Inch (1989) give a more interesting example, in that various qualifications are larded into a bit of medical reasoning:

> Data: 12 hrs ago, patient fell from scooter, had severe blow to head, has deep scalp wound, is pale, dizzy, lethargic, has low fever.
> Warrant: In the absence of preventive measures, injuries of this kind lead to infection.
> Claim: Recommended treatment is to flush, stitch up wound, administer antibiotics, and ask for bed rest. (p. 166)

Two conclusions might be drawn from these examples. First, in practice warrants seem to be very similar, in most cases, to conditionals, and figure into arguments in much the way that conditionals figure into modus ponens. If true, this would reduce the novelty and usefulness of Toulmin's account of argument, making it difficult to use for teaching or analysis. Second, since Toulmin claims quite explicitly to be giving an alternative account, one has to ask whether it's he or his interpreters who has gone wrong here. The answer, again, is a bit of both, but Toulmin's view is certainly more complex and interesting that anything that gets represented in textbooks.

Toulmin himself makes a fairly complex case for warrants, and they really embody what he thinks is novel in his system. His most general characterization is as the connection between facts/data and a claim; the warrant gives 'permission' to make the move, and answers the question 'How do you get there?' In the chapter 'The Layout of Arguments', he makes a series of distinctions, attempting, in essence, to open up a new space for understanding argument. He claims that philosophers to that point have mistakenly confused *analytic* with *formally valid*, and assumed only formally valid arguments may have logically necessary conclusions, a property he calls *conclusiveness*. Philosophers have thus assumed that substantive inferences (typified for Toulmin by the inference from 'Peterson is a Swede' to 'Peterson is not Catholic') can have only probable conclusions. He wants to argue that there are both analytic arguments with probable conclusions as well as substantive arguments that are conclusive:

> Yet often enough logical theorists have attempted to run these two distinctions together, identifying analytic arguments with necessary or conclusive ones, and substantial arguments with tentative, probable or inconclusive ones. The crucial question is whether this conflation can be justified, or whether, rather, we do not have occasion in practice to classify some arguments as at once substantial and conclusive, or as both analytic and tentative. (126)

His example of the first type is what he calls the 'quasi-syllogism', which is analytic in form (as a syllogism) yet contains qualifiers such as 'almost certainly' or 'probably.' (Hence in some of the examples above we were seeing 'quasi-conditionals.') The second type, in which he is more interested, has examples like the following:

> If told that the wall is 6 ft. high and the sun at an angle of 30 degrees, a physicist will happily say that the shadow *must* have a depth of ten and a half feet. (p. 127)

Why does Toulmin think this kind of example would be controversial to a logician, since it simply involves plugging numbers into a formula? Because the conclusion is not simply an abstract number ('3 + 5 = 8', where '8' is just a number, not a quantity of something) but refers to a fact about the world – the length of the shadow in this case. This is a fairly subtle difference, and one really has to think back to Toulmin's jurisprudential model to grasp what's 'substantial' here. In logic, the '10.5 ft.' would have to be regarded as simply the implication of the formula, the correct answer so to speak. But in an actual situation of argumentation, it might be a prediction about where one will find the edge of the shadow, or maybe a justification for where one should put the picnic basket to keep it out of the sun. In these senses, attached to a context of argument, the claim about 10.5 ft. is substantive in that it is bound to circumstances outside the argument itself. Not surprisingly, for Toulmin the difference between a merely logical MPP and a substantive one depends, in the cases he considers, on the *use* of the argument.

My point here is that there is a sort of paradox buried at the heart of the Toulmin model, in that he wants to have it both ways: a formalist's sense of the logic of arguments, but a pragmatist's sense of how arguments get used, and of their practical limits; he parses this difference in traditional logical terms, as the difference between formal and substantial concepts of inference. His solution, as we have seen, is to claim that warrants are non-formal devices which nonetheless can yield conclusive arguments – substantial, yet possessing the attractions of formal argument. But we've also seen that warrants, in practice, seem to end up being remarkably similar to the material conditional, and hence to the familiar argument form modus ponens. (Freeman, 2000, even asserts that a 'generalized conditional' corresponds to each warrant.) He splits the difference by claiming, in essence, that a warrant is formal, while its backing is substantive, and so (since they are – logically? – interchangeable) arguments that look like modus ponens are in fact substantive. In my view, Toulmin seems to be describing the properties of a non-monotonic reasoning system, which has pretty much just the features he would like to see.[1] In the next section, I will briefly describe the features of non-monotonic reasoning systems, and attempt to show how they account for the features of argument in which Toulmin is interested.

[1] Certainly I am not the first to link Toulmin to non-monotonic reasoning, though none of the accounts I'm aware of explicitly works out the relationship. See Loui (1995), Bench-Capon (1995, 1998), Parent (2000) and Freeman (2000).

NON-MONOTONIC REASONING SYSTEMS[2]

A reasoning system is a set of rules plus the inferences that can be generated from the rules. For example, if A and B are variables for formulae, then with the rule 'if A then B, and A, you may infer B' ('$A \rightarrow B \wedge A, \models B$' in the usual notation), then one can generate many 'B's', which are called sentences; some of those sentences are *theorems* (that is, they are entailed/implied by the rules of the system). With a number of inference rules, as well as logical connectives to form complex formulae, the full set of the theorems of the system can be generated. In the most common kinds of systems, the nature of the inference rules is such that no inconsistent theorems can be proved; the point of these rules is that they ensure that all the theorems can be true simultaneously. Now, what happens when a new theorem is added to such a system? If a logical system is monotone (i.e. has the property of monotonicity), then added theorems must be consistent with the system, and increase the size of the system, and thus the total number of theorems in the system. A monotone logical system cannot decrease in size because of 'new' information; one can always deduce everything one has in the past.

More formally, if Δ is a set of sentences, and Γ is a subset of those sentences, if $\Gamma \models \varphi$, then the larger set $\Delta \models \varphi$; in a monotone system the extra theorems in Δ don't make any difference to the implication of φ. But in a *non-monotonic* system, the total set of theorems might be revisable, and hence might shrink. In that case, if $\Gamma \models \varphi$, and set Δ is created that contains Γ, Δ may no longer imply φ, even though all the original information that implied it is present. In such a system, new information can cancel out existing theorems, and the total set could grow smaller. In this case, the inference relation is not the classical one, $\models$, but another one we could symbolize by $\vdash$. So in a non-monotonic logic, if $\Gamma \subseteq \Delta$, and $\Gamma \vdash \varphi$, then it may not be the case that $\Gamma \vdash \varphi$. Intuitively, this corresponds to the behavior of our beliefs; someone may have a large number of beliefs (and beliefs inferred from them) about whales being fish; when he discovers that his initial belief is false, then he will give up all the inferences he had made from it as well, and the total number of his beliefs may grow smaller.

The point is that revisable (or what Toulmin calls *tentative*) inferences can be expressed as part of a formal system of inference. Such inferences are often called *defeasible*, since they can be, so to speak, taken back in light of subsequent information. Defeasibility is often understood on a *default* model: The inference goes through, unless there is reason to think otherwise.[3] Default inferences can take several forms (Lukaszewicz, 1990, 82-87), and it's worth sorting them out, since different kinds of non-classical inferences typically get lumped together.[4]

Prototype: A feature is true of a type, unless there is a confounding fact:

Tweety is a bird	*but*	Tweety is a bird
Birds fly		Birds fly
$\therefore$ Tweety flies		Tweety has an injured wing
		$\therefore$ Tweety doesn't fly

[2] This is a very simplified presentation, and for purposes of exposition the semantic version of inference is presented throughout; details on non-monotonic reasoning systems are available in Lukaszewicz (1990) and Gabbay et al. (1994).

[3] Toulmin himself stresses the importance of the 'rebuttal', which amounts to this default clause.

[4] Another kind of non-monotonic reasoning, autoepistemic reasoning ('If φ were true, I'd know about it already, so it must not be true'), is not as directly applicable to the Toulmin model; the same holds for Reiter's (1978) 'closed world assumption.' Neither will be discussed here.

In the case of prototypes, the inference is based on a background scheme of understanding about the typical traits of the thing or event in question. These are legitimate inferences, unless information is present which defeats them. Notice that the information about the injured wing shrinks the total set of inferences, since not only does the inference about Tweety flying go away, but all the inferences from flying (being in the air, moving at given speed, and so forth).

Presumption: Presumptions indicate, based on practice rather than category, how an inference should be made.

Tom has the book	*but*	Tom has the book
∴ It's Tom's book.		Gene says Tom took it without asking
		∴ It may not be Tom's book

Obviously presumptions are very important in legal reasoning, but the idea of presumption has wide applicability (see Rescher, 1976, 1977). Lukaszewicz calls this 'no-risk' reasoning, since even if a defendant is probably guilty (with a moderate degree of probability), the harm of convicting an innocent person is so great that it's better not to risk it unless that probability is quite high.

Best Guess: In a case where a decision must be made, inferences can be made from partial or contextual information:

I need to find an open drugstore on Sunday
I don't know which ones are open
There are two drugstores, one is 1 mile and one is 10 miles from my house
∴ I should go to the closer store

The key characteristic of this inference is that neither action is inconsistent; the actor lacks any knowledge that would make the closer store an unreasonable choice, and so on the grounds of fuel economy the closer store a good choice, since it is as likely (given what's known) to be open as the other store.

Probability: Probability, interpreted in a subjective or Bayesian mode, justifies a defeasible inference.

I've always had good meals here in the past
∴ I'll probably have a good meal today

While there might be intervening factors that would make the inference unjustified (the cook is ill, the kitchen burned down, etc.), the probability of a good meal, given the evidence, is strong.

Toulmin's favorite example of a defeasible inference is the following one:

Peterson is a Swede
∴ Peterson is not Catholic

But this particular example is ambiguous with respect to these different notions of default: it is compatible with all of them. Toulmin himself wavers. His basic contention seems to be that the argument requires a warrant that states a prototypical inference, 'Swedes are Lutherans.' But he claims that this inference is justified by (i.e., has as its backing) the probabilistic evidence that 98% of Swedes are Lutheran. So, for Toulmin, this probable evidence can be substituted, *salve veritatis*, for the prototype statement, giving rise to his examples of analytic yet defeasible arguments. He is probably doing himself an injustice in making this dodge; he need not transgress these categories. It's easy to imagine circumstances in which each of these default-inference types is present. If we're discussing Peterson's views on the Pope, he may be prototypically assumed to be a non-Catholic. If we're arguing with someone about Peterson's religion, we have the right to expect that claiming he is Catholic does not have equal status with the claim he is Lutheran; claiming he is Catholic takes on the burden of proof. If we have Peterson to dinner on a Friday, we might decide to guess that we don't have to serve fish. Or we can cite statistics to justify a claim about his religion.

While it's easy to run all of these of default inferences together, Clark (1990) claims that we should recognize the difference between logical and probabilistic inference here. Clark claims that in all reasoning a kind of uncertainty is at issue: probabilistic, conditional, disjunctive, assumptive and so forth (pp. 1-2). Some of these types of uncertainty (such as disjunction) can be represented in classical logic, but most cannot. Clark distinguishes between plausible and probable inference:

> Probabilistic statements ('most birds fly', 'typically birds fly', etc.) refer to statistics over a given population. Logic statements, however, refer to conclusions which, when drawn are treated as 'definite' until further evidence comes along. Logic statements make no comment on the statistics about a given population. (p. 2)

He points out that while each kind operates on a default model, they have quite different inferential structures. Returning to the $\vdash$ operator for non-monotonic implication, consider the following: A $\vdash$B, unless B is inconsistent, B $\vdash$C, unless C is inconsistent, $\therefore$ A $\vdash$ C, unless B and C inconsistent. On a prototypical interpretation of $\vdash$ this property of transitivity holds (if a bird $\vdash$ it has wings, if it has wings $\vdash$ it flies, so if a bird $\vdash$ it flies). But on a probabilistic interpretation (where $\vdash$ means 'mostly'), transitivity doesn't reliably hold ('most penguins are birds', 'most birds fly', but *not* 'therefore most penguins fly'). Clark is correct that most authors do not distinguish probable and logical defeasible inference (apparently believing falsely that they are syntactically identical even if semantically distinct). Yet the tendency to lump all defeasible inference together with probability cheats argument theorists of a valuable distinction.

SUMMARY

While computer scientists and others fruitfully explore the formalization of defeasible inference, I would claim that their work could shed significant light on a difficult and important part of Toulmin's theory of argument. It might also enhance pedagogy, making it possible to teach students clearer ways of sorting out warrants in specific domains.

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