

Good reasoning on the Toulmin model

ABSTRACT: Some solo verbal reasoning serves the function of arriving at a correct answer to a question from information at the reasoner's disposal. Such reasoning is good if and only if its grounds are justified and adequate, its warrant is justified, and the reasoner is justified in assuming that no defeaters apply. I distinguish seven sources of justified grounds and state the conditions under which each source is trustworthy. Adequate grounds include all good relevant information practically obtainable by the reasoner. The claim must follow from the grounds in accordance with a justified general warrant. If this warrant is not universal, the reasoner must be justified in assuming that no exception-making circumstances hold in the particular case to which it is applied.

KEY WORDS: reasoning, Stephen E. Toulmin, good reasoning, justified conclusion, justified premiss, adequacy

Stephen Toulmin (1958, 2003) advanced his model for the layout of arguments without providing criteria for evaluating arguments so laid out. Some criteria are given in his co-authored textbook based on this model (Toulmin, Rieke and Janik, 1978, 1984). On page 238 of the 1984 edition, for example, the authors prescribe eight "essential merits" of arguments: clarity on the kind of issues the argument is intended to raise, clarity on the underlying purpose of the argument, grounds relevant to the claim, grounds sufficient to support the claim, warrant applicable to the case under discussion, warrant based on solid backing, modality or strength of the resulting claim made explicit, possible rebuttals or exceptions well understood. But these conditions are underdeveloped. The textbook focuses rather on the structure of arguments and on the forms their components take in different fields.

Toulmin's model applies not only to arguments, whose authors address verbalized

reasoning to someone else, but also to solo verbal reasoning, in which reasoners draw conclusions for themselves from information at their disposal. I shall propose guidelines for such reasoning, from the perspective of someone about to engage in it rather than of someone critically evaluating it after the fact. Solo verbal reasoning as I understand it must have some verbal components (merely thought, spoken aloud, written, signed, etc.) but can have non-verbal components. For example, its grounds can include non-verbal perceptual stimuli or non-verbal symbolic artefacts such as figures and drawings. In what follows, I shall use the unqualified term “reasoning” as a convenient abbreviation for “solo verbal reasoning” as just defined. I shall assume that the Toulmin model and its components (claim, grounds, warrant, qualifier, rebuttal, backing) are known, and shall propose criteria for good reasoning in terms of the components of this model. I shall use “conclusion” as a synonym of “claim” and “premisses” as a synonym of “data” or “grounds”; the latter usage reflects my position, argued elsewhere (Hitchcock, 2003), that the warrant of an inference is not a premiss but an inference-license. Although I shall not discuss solo non-verbal reasoning, I make no assumption about whether the Toulmin model applies to such non-verbal reasoning.

Goodness of a kind is relative to function. A good eye is one that has characteristics that are sufficient for seeing well. A good bread knife is one that has characteristics that are sufficient for cutting bread well. Similarly, good reasoning is reasoning that has characteristics that are sufficient for accomplishing well the function of the reasoning. Reasoning in fact has many functions, for each of which there will be a correlative account of its goodness. I shall focus on one common function of reasoning: to arrive at a correct answer to a question whose answer is not immediately obvious to the reasoner but may be inferred from information at the

reasoner's disposal. The question may be purely theoretical: Why did the aeroplane hijackers who attacked the World Trade Centre choose September 11 as the date of their attack? Or it may be practical, or practically oriented: What possible difficulties do I need to be aware of before starting to install a central vacuum system in my house? How long will it take to get to a place I plan to go to tomorrow? What is the best way of handling my two-year-old's temper tantrums? Sometimes the answers to such questions are obvious, but when they are not, and we have or can get information from which to work out an answer, reasoning is appropriate. Naturally we want to arrive through this reasoning at a correct answer.

There is of course no litmus test or gold standard for correctness of conclusions. We cannot write the conclusion on a piece of paper, dip it in a liquid, and determine from the colour of the paper whether the conclusion is correct or incorrect. We are not infallible visionaries, but human beings, working with incomplete information of less than perfect quality. Instead of correctness or truth, we must make do with the next best alternative: justification by the best practically obtainable evidence. This is why many warrants hold in most or some cases rather than in all cases, why we qualify our conclusions with such words as "probably" or "possibly", and why we acknowledge potential rebuttals.

Our immediate goal, then, is to reach the answer that the best relevant practically obtainable evidence justifies us in accepting. I propose four individually necessary and jointly sufficient conditions for reasoning that reaches this goal. First, we must be justified in accepting the ultimate grounds on which we base our reasoning. Second, our grounds must include all the relevant justified practically obtainable information. Third, the conclusion must follow in virtue of a justified warrant. Fourth, if the warrant is not universal, we must be

justified in assuming that in the particular case there are no defeaters that rule out application of the warrant. I propose these conditions for reasoners to apply to their own reasoning, thus abstracting from consideration of the audience and dialogical context when reasoning is verbalized to others. Let us now consider each of these conditions in detail.

1. JUSTIFIED GROUNDS

It is perhaps self-evident that good reasoning with a function of arriving at a previously unknown correct answer to a governing question must start from grounds that we are justified in accepting. Correct conclusions can follow from incorrect premisses, but it is an accident if they turn out to be correct. To have some assurance of reaching our goal, we need justification for our starting-points.

There are many sources of justified premisses. The most trustworthy ones appear to be direct observation, written records of direct observation, memory of what one has previously observed or experienced, personal testimony, previous good reasoning or argument, expert opinion, and appeal to an authoritative reference source. None of these sources is infallible. Further, the list is open to emendation; in particular, it makes no special allowance for evaluative or normative ultimate premisses.

1.1. Direct observation

In general, the most basic source of justified premisses is direct observation. Seeing the thick black clouds getting ever larger in the western sky is good justification for believing that thick black clouds are forming in the western sky. Hearing the screaming of one's two-year-old

rapidly diminish in loudness after he is put into his room alone is good justification for believing that the temper tantrum faded away after he was put in his room alone. The smell of smoke is good justification for believing that there is smoke in the air one is breathing in. Observation includes not only such witnessing by the human senses but also the reception of information by some sensory apparatus like a telescope; Norris (1979) identifies observation with determining by the use of human or other sensory apparatus on some specific occasion what is happening or what state something is in, Shapere (1982) with reception by an appropriate receptor of information transmitted without interference from the observed entity. Observation so defined depends logically on a theory of the source of the information, a theory of its transmission and a theory of its receptor; if an observation is to be credible, such well-established theories must apply and the observer must at least know of their existence and applicability (Kosso 2001). But such background theories are not a part of the observer's reasoning. Rather, the observation is the starting-point, and it is used as the basis for further inferences, which in general will be less reliable than the observation (Norris, 1979). As physical knowledge increases, and new sensory receptors are invented and improved, the range of what can be observed expands; an extreme example of such expansion is the observation of the centre of the sun by the detection of neutrinos a mile beneath the earth's surface, discussed in a well-known paper by Shapere (1982).

Thus observation is not a passive reception of ready-made facts. Rather, it involves description and justification, description in expressing informational content in an observation report (possibly to oneself) and justification in that it must be possible to show that the report is about something (the source of the information, the observed object) and that it is accurate

(Kosso, 1992, p. 113).

When is an observation justified? Norris (1984) has proposed criteria for observing well, for reporting observations well and for appraising observation reports; the latter criteria incorporate those proposed by Ennis (1962, p. 90) and by Norris (1979, pp. 18-20) and by Norris and King (1984, p. 7). Such lists are derived from common-sense experience, from the practice of scientific observation, from the results of psychological experiments, and from treatment of eye-witness testimony in law courts; and are subject to correction from these sources. Synthesizing the work of Ennis and Norris with reports by Loftus (1979) and by Loftus & Doyle (1992) of the results of psychological studies, we can say that, in general, an observation is justified to the extent that the following conditions are met:

1.1.1) *Well-established background theories* of the source of the information, its transmission and the receptor *show that the receptor in such an observational situation accurately receives information from the source under normal conditions.*

1.1.2) *The sense or sensory apparatus being used* (e.g. sight, hearing, photographic plates, radar equipment, neutrino detectors) *is in good condition and functioning properly.* In particular, a human observer should be functioning at a moderate level of emotional arousal, neither so torpid as to be only dimly aware of the surroundings nor so highly stressed as to be incapable of observation of the complexity required (Loftus, 1979, pp. 33-36; Loftus and Doyle, 1992, pp. 29-33).

1.1.3) *The conditions for observation are adequate.* If the observer is using a human sense, the event must be within the observer's perceptual range: bright enough, loud enough, close enough to be picked up by the ordinary senses (Loftus, 1979, p. 22). Also, the medium of

observation should not systematically distort the observed characteristic. Also, the more time there is to make the observation and the more opportunities there are to make the observation, the more likely is it that the observation is accurate (Loftus, 1979, pp. 23-25).

1.1.4) *The information being received is of a sort that is generally accurately detected by the receptor.* This condition can be made more specific for human sense perception, as follows. The observed state of affairs should be salient, in the sense that it would be mentioned without prompting if the observer were to report immediately on what had just been observed (Loftus, 1979, pp. 25-27). Humans should be generally accurate at observing the type of fact being observed; for example, the duration of an event is *not* usually accurately observed, but is typically overestimated, particularly when an observer is feeling stress or anxiety (Loftus, 1979, pp. 27-31). If the observation concerns details of an event, the event should not be emotionally loaded (Loftus, 1979, pp. 31-32; Loftus and Doyle, 1992, pp. 24-29).

1.1.5) *The observer takes care to notice accurately.* Observation tends to be more accurate if the observer actively uses one or more senses to take in details of what is observed, rather than just attending to one aspect of the situation (Loftus, 1979, pp. 48-49).

1.1.6) *The observer, if human, is primed to observe accurately.* The observer should not be biased by previous expectations (cultural, personal, experiential or temporary) of what is going to be observed (Loftus, 1979, pp. 36-48; Loftus and Doyle, 1992, pp. 36-40). Observation tends to be more accurate if the observer has information before the observation that indicates the importance of correct observation in the situation (Loftus, 1979, pp. 49-51).

1.1.7) *The observer has whatever expert knowledge is required to use any instruments involved (e.g. a telescope) and to interpret what is observed.*

1.1.8) *No other justified information contradicts the observation.*

An observation that meets the just-mentioned criteria may nevertheless turn out to be incorrect. Things formerly taken to be observed can later be discounted as due to defects in sensory equipment or to mistakes in some theory used to interpret the equipment's output. Here, as elsewhere, justification is not truth.

1.2. *Written records of direct observation*

A second source is written records of direct observation. Such records are important in many professional contexts where the content of observations must be available and accurate long after the observation is made, such as scientific research, police investigation and medical examination. Written records make it possible to restore previous observations without depending on the vagaries of memory, which is notoriously plastic and unreliable (Schacter, 1995). Norris (1984, p. 136) proposes the following criteria for good records of observations:

1.2.1) The observation should be reported no more precisely than can be justified by the observational technique that was used.

1.2.2) The record should be made close to the time of observing.

1.2.3) The record should be made by the observer.

1.2.4) The record should be made in the same environment in which the observation was made.

1.3. *Memory*

A third source is memory of what one has previously observed or experienced. Human memory is basically accurate; we would not cope as well as we do if we did not remember accurately

how to get from A to B, where we left something we now want, and so forth. But it is subject to decay and error. As the work of Elizabeth Loftus (1979) among others has shown, distortions and failures can occur not only at the initial acquisition stage (the observation) and at the later retrieval stage, but also during the intervening retention stage—human memory is plastic. In *The Seven Sins of Memory*, Daniel Schacter (2001) classifies the causes of inadequate human memory. Three of his seven “sins” are sins of omission, causing failure to retrieve the desired information: absent-mindedness (lack of attention resulting in failure to store the information in the first place), transience (the fading of memory over time), and blockage (inability to retrieve something that is still stored in our memory). Another three “sins” are sins of commission in which we retrieve distorted information: misattribution (assigning what is remembered to the wrong source, even to reality rather than fantasy), suggestibility (implantation by leading questions, suggestions or comments at the time of retrieval), bias (editing of our remembered past in the light of current beliefs). The seventh “sin” is a source neither of failure nor of distortion, but of unwanted intrusion: persistence involves repeated recall of disturbing information that we would prefer not to think about. Schacter argues somewhat speculatively (2001, pp. 184-206) that these seven inadequacies are byproducts of otherwise adaptive features of human memory.

Schacter’s sins of commission warn us to attend to factors that reduce the accuracy of human memories. In particular, episodic memories decline in accuracy with the passage of time (Loftus, 1979, pp. 53-54; Schacter, 1995, pp. 25-26). Subsequent information or misinformation, especially when delayed or about peripheral details, can distort one’s memory, even to the extent of adding non-existent objects to one’s memory of an episode or changing

the type, colour or subjective impression of observed objects (Loftus, 1979, pp. 54-78; Loftus and Doyle, 1992, pp. 61-66). One's own thought processes—one's biases, one's labelling, one's guessing what one observed, one's verbalizing of a recollection—can affect how one stores in memory an observed episode (Loftus, 1979, pp. 78-87). Memories are in general less accurate about peripheral or unimportant details than about emotionally salient and central facts (Schacter, 1995, p. 16). False episodic memories can be produced in neurologically unimpaired adults by association with actual stimuli, by inferences from misinformation about the stimuli, by leading questions, by post-event misinformation, by previous forced guessing, by hypnosis, by emotional arousal at the time of observation (with respect to peripheral details), or by an incongruent mood (Schacter, 1995). The presentation of false post-event information commonly distorts memories in four circumstances: much time has elapsed, the false information is embedded in a subsidiary part of an information-seeking question, the observed event was violent (thus disrupting the initial storage of information in memory), and there is no warning immediately before receiving a post-event message that the message may contain misinformation (Loftus and Doyle, 1992, pp. 68-70). The information one retrieves from memory can be affected by whether the retrieval environment is the same environment in which the original observation was made; if the information is retrieved in response to questions, it can be affected by what types of questions are asked, how they are worded and who is asking them (Loftus, 1979, pp. 88-99). One's confidence in the accuracy of one's memory is not necessarily a good guide to how accurate it is (Loftus, 1979, pp. 100-104; Loftus and Doyle, 1992, pp. 75-77). Thus reasoners need to be careful about relying on memory alone. Loftus and Doyle cite experimental evidence, however (1992, pp. 81-83), that one can improve

one's memory of an episode by taking oneself through the four stages of a so-called "cognitive interview": reinstate mentally the context of the episode, report everything, recall events in different orders, recall the episode from different perspectives.

1.4. Personal testimony

A fourth source is personal testimony of what has been directly observed or experienced. Such testimony is no better than the observation or experience on which it is based. It must be scrutinized in terms of the criteria mentioned earlier for observation, written records, and memory. For example, testimony based on distant memories is suspect if unsupported by written records made at or near the time of the observation. Even apparently honest reports of current experiences must be evaluated for accuracy, since they can be unclear or involve questionable interpretation. Criteria for evaluating observation reports can be found in Ennis (1962, p. 90), Norris (1979, pp. 18-20; 1984, p. 137), and Norris and King (1984, p. 7).

It is particularly important in evaluating testimony to be on guard against secondhand, thirdhand, or more distant testimony. As the game of "telephone" dramatically shows, the quality of messages passed from one person to another tends to deteriorate with each transmission. An additional complication in evaluating testimony is the possibility that its author may distort the truth through a careless or intentionally deceptive formulation. Self-deception, faulty interpretation, and sloppy verbalization are more common than intentional deception.

1.5. Previous reasoning or argument

A fifth source is previous good reasoning or argument. The reasoner may already have reached a relevant conclusion by previous reasoning, for example that the date of September 11 is likely to have had some significance for the cause promoted by the attacks on the World Trade Center. Alternatively, the reasoner may have been convinced by someone else's argument to accept a relevant conclusion of that argument. If the relevant conclusion was justified by the earlier reasoning or argument, it becomes a justified premiss of the new reasoning.

1.6. Expert opinion

A sixth source is expert opinion, such as the opinion of a qualified electrician on the adequacy of a circuit for a particular appliance. In some cases, it is possible and desirable to scrutinize the reasoning by which the expert arrived at the opinion in question. In other cases, however, it is either impossible or undesirable to undertake such scrutiny, and the acceptability of the expert's opinion must be judged indirectly.

Ennis (1962, pp. 196-197) proposed criteria for evaluating expert opinion. Modifying his list in the light of reflection on the ways in which experts' opinions might be mistaken, we can say that, in general, expert opinion justifies a claim to the extent that the opinion meets the following seven conditions:

- 1.6.1) The opinion in question must belong to some subject matter in which there is expertise. An opinion can belong to an area of expertise even if the expertise is not based on formal education; there are experts on baseball and on stamps, for example.
- 1.6.2) The author of the opinion must have the relevant expertise. It is important to be on guard against "expert fixation", accepting someone's opinion because that person is an expert, when

the expertise is irrelevant to the opinion expressed.

1.6.3) The author must use the expertise in arriving at the opinion. The relevant data must have been collected, interpreted, and processed using professional knowledge and skills.

1.6.4) The author must exercise care in applying the expertise and in formulating the expert opinion.

1.6.5) The author ideally should not have a conflict of interest that could influence, consciously or unconsciously, the formulated opinion. For example, the acceptance of gifts from the sales representative of a pharmaceutical company can make a physician's prescription of that company's drug more suspect.

1.6.6) The opinion should not conflict with the opinion of other qualified experts. If experts disagree, further probing is required.

1.6.7) The opinion should not conflict with other justified information. If an expert opinion does not fit with what the reasoner otherwise knows, one should scrutinize its credentials carefully and perhaps get a second opinion.

Sometimes we do not know directly whether these seven conditions are met, and we must judge by inference. The track record of an expert in the relevant field of expertise is good evidence, positive or negative, about the trustworthiness of that expert's new opinion. Awareness by the expert that others will subject the opinion to scrutiny counts in favour of its trustworthiness.

1.7. Authoritative reference source

A seventh source is an authoritative reference source, such as an encyclopedia or the *Handbook*

of Chemistry and Physics. Authoritative reference sources differ from expert opinions in that they contain generic information, whereas expert opinions apply expertise to a particular situation. Ideally, authoritative references embody the best available evidence at the time they are composed.

1.8. General remarks

No matter how one's premisses are justified, it should be kept in mind that being justified is not the same as being correct. A premiss justified by direct observation, or by a written record of a direct observation, or by an authoritative reference source, may later turn out to be false. The friend one "sees" across the road may turn out on closer inspection to be someone else who looks like one's friend. The secretary taking notes at a meeting may have misheard or misinterpreted what was said. An entry in a reputable encyclopaedia, general or specialized, can be superseded by subsequent research or world events. The moral is: One should always be prepared to revise one's opinion in light of compelling new evidence to the contrary.

2. ADEQUATE INFORMATION

If one is trying to answer a question correctly on the basis of obtainable information, one needs to take into account all the good relevant information that is practically obtainable. Relevant information is information that could make a difference to the answer one reaches. That is, a justified warrant links it, in combination with other already obtained or obtainable information, to an answer to the question that could be different than the one justified by the information already obtained. In many contexts—such as medical diagnosis, police investigation, military

and other intelligence work, scientific research, interpretation of such symbolic artefacts as written texts or works of art or musical compositions, adjudication, consumer choice—different pieces of information often point to a different answer to a given question. Hence, if in such a context one considers only information that supports one answer, and ignores information that points to a different answer, one is more likely to reach an incorrect conclusion than if one considers everything. A common human failing is to close prematurely on a particular answer, then seek supporting evidence for this answer, while failing to seek (or even ignoring) evidence that points in a different direction. Indeed, high school English teachers often teach their students to write essays this way: Adopt a thesis, then assemble evidence to support it. This is a fallacy of empirical investigation known to psychologists as “confirmation bias” (Klayman, 1995). Both experimental-critical and historical-textual empirical investigators of human reasoning have concluded that the most common flaw of informal reasoning is the failure to consider lines of argument supporting conclusions contrary to the one reached (Finocchiaro, 1994). The mass media occasionally report examples of such failures in detective and intelligence work: convictions for murder are sometimes reversed on the basis of DNA evidence, and intelligence estimates of a foreign country’s military preparations sometimes prove wildly inaccurate. Confirmation bias occurs in a subtle way in the publication in scientific journals of experimental results that are tested for their statistical significance. Since the best journals are distinguished by the strictness of their criterion, accepting only results that are significant at the .01 level (as opposed to the .05 level or .10 elsewhere), the published evidence relevant to a given empirical question can be a biased sample of the evidence actually obtained by researchers.

In working out the correct answer to a question, one needs to consider only information that is good, relevant to the question, and practically obtainable. In other words, one can ignore information that is either bad or irrelevant or not practically obtainable.

Information used to arrive at an answer to one's question must be good information, in terms of the conditions previously mentioned for justified premisses. There is no point in taking bad information into account, still less in devoting time and effort to acquiring it.

Information used to arrive at an answer to one's question must be relevant, in the sense that taking it into account might make a difference to one's answer. Relevance is thus a function of context. Suppose the question is whether all swans are white. We have a justified assumption, well supported by direct and reported observation of birds of both sexes in many species, that birds of a single sex in a single species have uniform colouring; for example, all male cardinals have the same bright red colouring. Suppose that we are aware of observations of swans of both sexes in each of many species: mute swans, trumpeter swans, whistling swans, and whooper swans. Suppose that all observed swans of these species were seen to be white. Then observing more swans of any one of those species, of either sex, is irrelevant; we have strong reason to believe that no such additional observation will produce a different answer to our question. But then we hear reports that there are different species of swans in the southern hemisphere. Observing swans of those species is relevant. Once we become aware of observations of the "black swans" of Australia and New Zealand, which are as black as their name implies, then no further observations of swans is relevant; we have conclusive proof in the last observations of a negative answer to our question: not all swans are white. In general, if the justified premisses at one's disposal support an answer to one's question that no

additional evidence can overturn, then no such further additional evidence is relevant. Of course, if further information casts doubt on one or more of those justified premisses, then the situation can change.

Finally, information used in arriving at a correct answer must be practically obtainable. The word “practically” implies relativity both to the time and effort required to obtain the information and to the importance that one answer the question correctly and to the urgency of arriving at an answer. If it will take a two-minute Internet search to get relevant information of good quality, and one has the two minutes to spare, and it is important that the answer be correct, and one can wait two minutes before closing in on an answer, then one ought to do the Internet search. If the question is whether to quarantine a patient with symptoms like those of sudden acute respiratory syndrome (SARS), a contagious viral infection with a 15% mortality rate, and it takes a week to get the result of a “gold standard” test of the patient’s blood sample, then one quarantines the patient first (unless one can immediately exclude a diagnosis of SARS) and reviews the quarantine decision after receiving the result of the blood test. There is of course no general algorithm for balancing considerations of time, effort, urgency and importance of correctness in deciding whether it is practical to obtain a certain piece of good relevant information. Judgement is required. There may however be algorithms for determining in specific domains whether it is practical to obtain good relevant information.

3. JUSTIFIED WARRANT

If one’s reasoning is to justify one’s conclusion, that conclusion must follow from one’s premisses in accordance with a justified general warrant.

The phrase “*in accordance with*” means that the warrant actually applies to the inference. In other words, the warrant is semantically equivalent to some generalization of the reasoning’s associated conditional “if p_1 and ... and p_n , then c ”, where p_1, \dots, p_n stand for the premisses and c for the conclusion (with qualifiers and rebuttals removed). The requirement that the warrant actually apply to the inference is should be obvious. A subtle danger in reasoning, which reasoners may not notice, is the use of a generalization of the converse of the associated conditional. For example, one may reason from hearing a train-like whistle that a train is in the vicinity. Reflecting on why one thinks this follows, one might propose the generalized warrant: If a train is in the vicinity, then I hear a whistle like the one I just heard. But this is the converse of the required warrant, which is rather: If I hear a whistle like the one I just heard, then a train is in the vicinity. This warrant may not be justified; for example, one may be aware that one has a neighbour who is a train aficionado addicted to playing recordings of trains at high volume and that there are no train tracks in one’s vicinity. (If the conclusion is qualified by the word “possible”, then a generalization of the converse may support the inference, in so-called abductive reasoning, i.e. reasoning from some observed phenomenon to a hypothesis that may explain it. But the generalization of the converse seems to be in Toulmin’s terminology backing for the warrant, rather than the warrant itself. The warrant is: whenever someone hears a train-like whistle it may be produced by a nearby train. The backing for this warrant is: If the driver blows the whistle of a nearby train, it makes a sound like the sound I just heard.)

In addition to being applicable, the warrant must be *general*. No conclusion follows in just one particular case; if it follows in one case, it follows in parallel cases. An applicable

warrant picks out a class of such cases. It is important to realize that there may be several ways of doing so. In general, warrants generalize over the repeated content expressions of one's reasoning, and they must generalize over at least one content expression that occurs both in a premiss and in the conclusion (Hitchcock, 1985). If more than one content expression is repeated, then the reasoning has several potential warrants for the inference. Furthermore, the extent to which one generalizes over a given content expression is variable. In the example just mentioned of the train-like whistle, one might generalize over the implicit time constant "now" to all times, to a given time of day, or to a given time interval like the current calendar year. These three generalizations produce three different warrants: whenever I hear a whistle here that sounds like this a train is in the vicinity, whenever at about 7 p.m. I hear a whistle here that sounds like this a train is in the vicinity, whenever in the current calendar year I hear a whistle here that sounds like this a train is in the vicinity.

The requirement that the warrant be general is not a requirement that it be universal. Warrants, as Toulmin pointed out, can be modally qualified, as holding for the most part, or *ceteris paribus*, or even just sometimes. Such qualifications, along with qualifications of the epistemic status of the warrant, imply imperfect support for the conclusion, which may or may not be explicitly marked in one's reasoning.

Finally, the warrant must be *justified*. It is neither necessary nor sufficient that the warrant actually hold, i.e. that the generalization is correct (whether universally, for the most part, or *ceteris paribus*). Correctness of the warrant is not sufficient, because reasoners need to draw inferences in accordance with warrants of which they are actually aware. Thus, for example, a logic student in the 1920s who considered axiomatized Peano arithmetic could not

use the correct generalization that no consistent axiomatization of arithmetic is complete to draw the conclusion that axiomatized Peano arithmetic is incomplete, because this generalization had not yet been shown to be true. Correctness of the warrant is not even necessary, for the same reason that it is not necessary that the premisses of good reasoning be true. Fallible human reasoners with limited resources have no direct access to truth, or more broadly to correctness; they must make do with what at any given time they are justified in accepting. The corollary of this fallibility is that good reasoners must be ready to revise their cognitive commitments, including the warrants in accordance with which they reason, in the light of new good evidence.

In Toulmin's model, warrants are justified by backing. His conception of backing, and his distinction between warrant-using and warrant-establishing arguments, is linked to his strong field-dependency thesis, about which reservations have been expressed, for example in several chapters of Norris (1992). In fact, there seems no reason to postulate a sharp difference in kind between warrant-using reasoning and warrant-establishing reasoning. If one is reasoning to a conclusion that will later serve as a warrant for further reasoning, the conclusion is one's claim and the "backing" for that claim constitutes one's grounds; the inference from grounds to claim will have its own warrant. In good medical reasoning, for example, conclusions about individual patients are reached using so-called "evidence-based" generalizations about risk factors, diagnosis, prognosis or treatment. The evidence that justifies such generalizations tends to take the form of clinical trials and other analytical studies, the conclusions from which are incorporated through meta-analysis and systematic review into authoritative clinical guidelines and references. Reasoning from the results synthesized in a

systematic review to a clinical guideline is, in Toulmin's terminology, another instance of reasoning from grounds to a claim, only at a higher level than reasoning that applies a clinical guideline to the observed circumstances of a particular patient.

4. JUSTIFIED IN ASSUMING NO DEFEATERS APPLY

A well-known feature of Toulmin's model is that many warrants come with rebuttals, or exceptional conditions under which the warrant lacks authority or is inapplicable, or the conclusion is false; Verheij (2002, 2055) has clearly distinguished these various types of rebuttals, which Toulmin lumps together. If the warrant that justifies one's inference is not universal, one must be justified in assuming that no exceptional condition in the particular case rules out application of the warrant. Such exceptional circumstances include not only circumstances that show that the conclusion is incorrect but also circumstances that show that the warrant is inapplicable to a particular situation, even though the conclusion may be correct. The former type of exceptional circumstance, one that shows the conclusion to be incorrect, may be said to *override* (Pinto, 1999) or *rebut* (Pollock, 1970) the warrant; a standard example is the circumstance that a bird is a penguin, which overrides the warrant that birds fly (since penguins do not fly). The latter type of exceptional circumstance, one that shows the warrant to be inapplicable even though the conclusion may nevertheless be correct, may be said to *undermine* (Pinto, 1999) or *undercut* (Pollock, 1970) the warrant; a standard example due to Pollock (1995) is the undermining of the warrant that things that look red are red by the circumstance that the object one is looking at is illuminated by a red light. The distinction between overriding defeaters and undermining defeaters was first made by Pollock in his

(1970); there may be other types of defeaters. Verheij (2002, 2005) has added two other types to Toulmin's three types of defeaters, and has developed a subtle theory of the way in which the justification status of the components of the Toulmin model changes as defeaters of various sorts are acknowledged, including defeaters of defeaters. For the warrant in particular, the central point is that, if one is not justified in assuming that a warrant lacks defeaters in the particular case, then one's conclusion about that case is obviously unjustified.

The condition that one is justified in *assuming* that no defeaters apply is weaker than the condition that one has a justification (i.e. proof) that no defeaters apply. To require a reasoner using a non-universal warrant to have a justification that no defeaters apply is to impose too great a burden of proof on the reasoner. The non-existence of a defeater is not a ground from which the reasoner arrives at a given conclusion; if it were, the reasoner would need to have as good a justification for it as for any ground. Rather, defeaters are something to be aware of as a possibility; in many cases, there are indefinitely many possible defeaters, and it would paralyse reasoning to require a reasoner to have a justification for excluding each and every one of them.

What does it take to be justified in assuming that no exception to a warrant applies to the particular case about which one is reasoning? In some situations, institutional and legal requirements impose obligations to determine whether anything about a particular case defeats the warrant. For example, a detective must ensure that the evidence that can be presented in court will be sufficient to prove beyond a reasonable doubt that the suspect is guilty of a criminal offence. A physician has a duty to conform to recognized standards of care. Such institutional requirements can be given a consequentialist justification.

More directly, in the absence of such institutional requirements, one can take a directly consequentialist approach. *First*, one must know of no exception to the warrant in the particular case. *Second*, if an exceptional condition has serious consequences and one can find out without too much difficulty whether it is present in the particular case, one must find out whether the exceptional condition is present. For example, it is generally safe to start across an intersection when the light turns green, but not if another vehicle is running a newly red light on the cross street. Since it takes only a brief look in each direction to find out if any vehicle is running the red light, an appropriately careful driver will look in each direction as the light turns green. (The example is a bit artificial, since the behaviour of experienced drivers in such routine situations is a matter of automatic habit, but reasoning can be used in forming such habits, for example, in driving instruction.) The more serious the consequences of an exception, the more effort one should be prepared to put into finding out if it is present. It is a matter of judgement where to draw the line. *Third*, if one knows of no exception and one's pragmatically justified investigation has not discovered an exception, one can draw one's conclusion *as if* there is no exception. But one should be alert to the possibility of discovering at a later time some exceptional circumstance pertaining to the particular case. If one's observation of a clock leads one to conclude that the time is 10:15, and shortly after one sees another clock which reads 11:20, then one should suspend judgement as to what time it really is until one finds out which of the two clocks is correct.

SUMMARY AND COMPARISON

The four conditions—justified grounds, adequate information, justified warrant, justification

in assuming no exceptions apply—are individually necessary and jointly sufficient for good reasoning. If any one of the four conditions is absent, the reasoning is not good; it does not justify the conclusion. If they are all present, the reasoning is good; it does justify the conclusion.

Only two of the four conditions are intrinsic to the parts of the reasoning: justified grounds and justified warrant. The other two—adequate information and justification in assuming no exceptions apply—are characteristics of the activity of reasoning. They concern whether one has investigated and reasoned enough, and so belong to the pragmatics of reasoning. Toulmin himself already distinguished in *The Uses of Argument* the phases in such a process of investigation (1958: 15-22). Jean Goodwin has suggested, in a commentary on a version of this paper, that one could find the materials for a pragmatics of reasoning in the talk in civic debates about whether debaters have met their probative obligations.

Justification is not the same as truth, or correctness. Even bad reasoning can, by a lucky chance, arrive at a correct conclusion. And even good reasoning can, by an unlucky chance, arrive at an incorrect conclusion. The reason for preferring good reasoning to bad reasoning is that, on the whole, one is more likely to arrive at the correct answer to one's question through good reasoning than through bad reasoning.

The Toulmin-type approach to the evaluation of reasoning and arguments can be usefully compared and contrasted to an approach through the concepts of argumentation schemes and critical questions, pioneered by A. C. Hastings (1962) and developed among others by Manfred Keipointner (1992), Douglas Walton (1996), Wayne Grennan (1997) and J. Anthony Blair (1999, 2001). An argumentation scheme is a general pattern of argument, e.g.

from a sign to that of which it is a sign. The patterns so identified are typically so general that conformity to the pattern creates not even a presumption that the conclusion is to be accepted if there is justification for accepting the premisses. The critical questions relevant to a given argumentation scheme include questions about the premisses or grounds (are they true/acceptable/justified?), questions about the warrant, and questions about defeaters, generally posed in a way that does not differentiate between these functions. As Pinto (1999) points out, an argument scheme's critical questions about the acceptability of the premiss(es) and about the truth, sufficiency or contextual appropriateness of the warrant need to be answered positively before a particular argument conforming to the scheme can be treated as one that even creates a presumption that its conclusion is to be accepted. Such critical questions ought to be, but often are not, distinguished from critical questions about exceptional circumstances in the particular case that override or undermine the inference. The Toulmin-based approach described in the present paper makes the distinction clear. The approach of the present paper is also less restrictive than most of the literature on argumentation schemes about the types of argument schemes (i.e. warrants) to which reasoning and arguments can be expected to conform. That is a virtue, because random sampling of argumentative texts turns up many passages that are difficult to bring under the comparatively brief list of types recognized in the argument scheme literature (Hitchcock, 2002); Van Eemeren and Grootendorst, for example, recognize only three main types (1992, pp. 94-102). Grennan (1997) is an exception in having a quite lengthy and systematically generated list of argument schemes, and also in acknowledging the difference between presumption-creating critical questions and presumption-defeating critical questions. The present paper also differs from the

argument scheme literature in focusing on reasoning rather than argument. But all argument schemes can also be treated as reasoning schemes, as Blair (2001) for example notes.

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