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The New Dialectic: A Method of Evaluating an Argument Used for Some Purpose in a Given Case

The purpose of this article is to explain to the reader how to evaluate an argument critically with respect to how that argument was supposedly used for some purpose in a goal-directed type of conversational exchange. Of course, only so much can be explained in a short article. Nevertheless, by introducing the reader to the recent literature on argumentation, and to the main methods that are being developed in that literature, some insight into how to use the new techniques can be given. The subject is controversial, as well. Some deny that there can be any binding standards for judging when an argument is reasonable or not, or whether one argument is better than another, as used in a given case, in natural language discourse. Others feel that the only objective methods that can or should be used to support such judgments are those of deductive and inductive calculi of the kind that have for so long been central in the field of logic.

Because of the controversial nature of the subject, many fundamental logical and philosophical questions are raised in this article. What is the difference between argumentation and reasoning? What are the forms of presumptive inference commonly used in everyday argumentation? How are such inferences chained together to make up sequences of reasoning? How is such reasoning used for different purposes in different kinds of arguments where two parties are involved in a dispute? What are the relationships between argument and explanation? How can presumptive arguments be seen as instances of inference to the best explanation that provide a tentative basis for accepting a conclusion? How does arguing fix an arguer's commitment to specific propositions that can then be attributed to her, as representing her position? How do new argument moves in a disputation change that commitment? How should change of commitment be organized in different contexts of dialogue when two parties reason together for some collaborative purpose? In particular, what are the rules for retraction of commitments? Can these different normative models of dialogue be formalized, with precisely defined components and sets of rules? These are the new kinds of questions that are being asked.

In this article, an exposition of developments in argumentation theory is presented that gives the reader a revealing glimpse into how these questions are

being answered. The framework in which the questions are answered is called the "new dialectic". The new dialectic is mainly concerned with the most common kinds of everyday arguments, and is based on presumptive reasoning rather than deductive or inductive logic. Presumptive reasoning takes the form of an inference in which the conclusion is a guess or presumption, accepted on a tentative basis, and subject to retraction as a commitment, should new information come in. The new dialectic shares many common features with the old dialectic of Plato and Aristotle, but is also different from it in other features. In the new dialectic, argumentation is analyzed and evaluated as used for some purpose in a type of dialogue underlying a conversational exchange. Each type of dialogue has its own standards of plausibility and rationality against which to measure the successful use of an argument. Thus the new dialectic has a relativistic aspect that makes it different from the classical positivistic philosophy. But it also has a structure with logical standards of evaluation of argument use, which makes it different from postmodern anti-rationalism.

1. Old and New Ways of Thinking about Thinking

The positivistic philosophy that has been the orthodox way of thinking in the universities since the Enlightenment, and that has become even more dominant in the twentieth century took science, especially the hard sciences of mathematics, physics and chemistry, as the models of correct reasoning. The kinds of reasoning used outside science, like the kind of thinking used in everyday deliberations, or the kind for reasoning used in law and ethics, were simply dismissed as "subjective". Scientific reasoning, seen as consisting of deductive logic and inductive logic of the kind represented by the probability calculus, was taken to represent all of logic. This positivistic philosophy has failed to yield a theory of reasoning and argumentation that was useful for cognitive science, to explain how human or robotic agents can reason in collaboratively carrying out practical tasks on the basis of communicating shared assumptions, or in criticizing the views of another agent. This positivistic viewpoint saw deductive logic, of the kind one would find in the reasoning in Euclidean geometry, as the model of correct reasoning. The positivistic viewpoint saw reasoned thinking along the lines the receiving of knowledge and the revising of beliefs. Even the notion of an agent or thinker came to be abstracted out of the equation. An argument was seen as simply a "designated" set of propositions. Beyond propositional and quantificational logic, further conceptualization came to be based on the highly abstract notion of a possible world. Reasoning was thought to be about various kinds of "accessibility relations" between pairs of possible worlds.

In the positivistic viewpoint, concern with thinking centered on a highly abstract subject called "epistemology". In epistemology, knowledge and belief existed, and the central problem was how to connect the two concepts. The subject matter seemed to consist mainly of endless controversies about whether knowledge could be defined as justified true belief.

Both these lines of advance turned out to be dead ends. Spectacularly so. Traditional logic and analytical philosophy turned out to have not enough to say that was useful to tell those in the field of artificial intelligence how rational thinking should work. The aging priests of analytical philosophy still talk enthusiastically about possible worlds and justified true beliefs, at some centers of learning. But judging from the little respect accorded logic, the humanities and philosophy in recent years, not many are listening any more. To fill the gap, postmodern theories came along to advocate throwing aside any pretense to rationality. But this viewpoint did not turn out to be a success either.

Then along came argumentation theory. A rational argument was now described in terms of acceptance (commitment) instead of belief or knowledge. Departing from the impersonal framework of deductive logic, argumentation theory saw an argument as a dialogue exchange between two parties who are reasoning together. No longer exclusively concerned with deductive and inductive forms of argument, argumentation theory considered many forms of presumptive inference based on intelligent guessing that leads to a tentatively acceptable conclusion on one side of a dialogue. This new viewpoint is not acceptable to traditional analytical philosophers who are so used to looking at the world through positivistic lenses. But computing, and artificial intelligence in particular, has taken to argumentation like a duck to water, finding this new theory very useful for all kinds of purposes. Philosophers will also accept these views at some point in the future, once they realize that scientists have accepted it.

2. The New Dialectic

This article presents an introduction to and outline of a new dialectic designed to be used to normatively evaluate any arguments used in a given case. Originating in the old dialectic of the ancient philosophers, the new dialectic is centrally concerned with the most common kind of arguments used in everyday conversations, which is based on presumptive reasoning rather than deductive or inductive logic. Presumptive reasoning is always based on default by an argument from ignorance that tilts a burden of proof one way or another on an unsettled issue. Presumptive reasoning can be used in a closed world

situation or an open world situation. In what Reiter (1980, p. 69) calls the closed world assumption, all the positive information in a data base is listed, and therefore negative information is represented by default. For example, in case 1 below (Reiter, 1980, p. 69), the design of an artificial intelligence question-answering system is considered.

Case 1

Consider a data base representing an airline flight schedule and the query "Does Air Canada flight 113 connect Vancouver with New York?" A deductive question-answering system will typically treat the data base together with some general knowledge about the flight domains as a set of premises from which it will attempt to prove $\text{CONNECT}(\text{AC113}, \text{Van}, \text{NY})$. If this proof succeeds, then the system responds "yes".

But, as Reiter indicates, the interesting fact is that if the system does not succeed, it will typically respond "no". In other words (Reiter, 1980, p. 69), "Failure to find a proof has sanctioned an inference." Such an inference by default has often traditionally been called a lack-of-knowledge inference or an *argumentum ad ignorantiam*. The same kind of inference drawn by Reiter's artificial intelligence system might be drawn by a human reasoner who is scanning the flight monitor at the airport. When such a person sees the listing of flights on the airport monitor, he presumes that all the flights are listed, and infers by default that any flight not listed is not offered. Of course, he can always check by asking at the desk. But the inference by default is most likely a pretty good guess, because the person is plausibly justified in assuming that the closed world assumption is met in this case. If the closed world assumption is in place, then the inference is more than just a hypothesis or assumption. Once the data base is closed off, the negative inference by default from the data base is such that we can say that the conclusion is known to be true (assuming that all the data in the data base are known to be true).

But most argumentation in everyday conversational exchanges is based on the open world assumption, where we are uncertain whether the data base is complete, or think it is incomplete, and we have to make a guess about conclusion to infer. It is precisely in such a guesswork situation that presumptive reasoning becomes most useful. Hence the real practical importance in argumentation of the form of reasoning often called the argument from ignorance, outlined in section five below.

Presumptive reasoning works by making a guess, in the form of drawing a conclusion and accepting it on a tentative basis, subject to possible retraction as a commitment, should new argumentation alter the case. A presumptive

inference gives an arguer a reasons for accepting a conclusion, even though that conclusion may later have be withdrawn if critical questions are asked in the dialogue. Nevertheless, although such forms of inference are neither deductively valid nor inductively strong, they do have a certain standing or bindingness in a dialogue. The form of inference does have a logical structure. It tells you that if you accept the premises, and the form of the argument is structurally correct, then unless you can ask the right critical questions, you must accept the conclusion. Such forms of inference called argumentation schemes represent the logical structures of these kinds of arguments.

In the new dialectic, reasoning is defined as a chaining together of inferences. Reasoning can be used for various purposes. It is used in explanations as well as in arguments. An argument is a use of reasoning to fulfill a goal of a dialogue, of one of six basic types. All argument is to try to settle some issue that has two sides. The present view is called dialectical because every argument is seen as a case of two parties reasoning together for some purpose. What is primarily important in the dialectical system of evaluating arguments is not (at least centrally) knowledge or belief, but something called commitment. This term refers to the acceptance of a proposition by a participant in a dialogue. Commitments do not have to be logically consistent with each other. But if a proponent's set of commitments are apparently inconsistent in a case, a respondent can challenge that inconsistency, and call for some resolution or explanation of the apparent inconsistency.

The new dialectic is amenable to formalization, as shown by Hamblin (1970), and Walton and Krabbe (1995). But the formal structure required is quite different from that of the traditional deductive propositional and quantifier logics. The formalization is a game-like structure in which, there are two participants, a proponent and a respondent. Each takes turn, making moves - generally asking question, replying to question, and putting forward arguments. The type of dialogue, as a whole, has a goal, and each participant has an individual goal (or role). The rules define what kinds of moves are considered legitimate for the purpose of contributing collaboratively to the goal of the dialogue. In some types of dialogues, the individual goals of the participants are opposed to each other. Other types of dialogue are not adversarial in this same sense, and the participants are supposed to cooperate with each other and help each other to work towards the goal together.

3. The Old Dialectic

The ancient art of dialectic was a philosophical activity in which two persons took part. The questioner first poses a problem, the respondent chooses a

position, and then the questioner draws inferences based on the respondent's answers (Kapp, 1942, p. 12). Evidently the questioner's aim was to draw out conclusions that raise doubts about the respondent's position, perhaps even conclusions that appear to be inconsistent with the respondent's position. But the exact purpose of dialectic as an organized and goal-directed activity is obscure to the modern reader of ancient philosophical texts. It is an art that fell into obscurity after the fall of the ancient world.

Plato called dialectic "the art concerning discussions" (Robinson, 1953, p. 69), but tended to shift his meaning of the term to describe "the ideal method, whatever that might be." (Robinson, 1953, p. 70). Zeno of Elea was supposed by many in the ancient world to be the inventor of dialectic (Kneale and Kneale, 1962, p. 7), but it is not known exactly what Zeno had in mind. According to the Kneales (p. 7), Plato in the *Parmenides* refers to Zeno's claim to have written a book in which he draws out some absurd philosophical consequences of another person's philosophical view. This reference may have been the basis of Aristotle's later remark, quoted by Diogenes Laertius and Sextus Empiricus, that Zeno was the inventor of dialectic. For a clearly articulated explanation or analytical theory of what dialectical argument is supposed to be, Aristotle's account is probably the most useful source.

Aristotle, in *On Sophistical Refutations* (165b3-165b4), defined dialectical arguments as "those which, starting from generally accepted opinions (endoxa), reason to establish a contradiction." According to the *Topics* (100b22), generally accepted opinions are "those which commend themselves to all or to the majority or to the wise - that is, to all of the wise or to the majority or to the most famous and distinguished of them." For Aristotle then, dialectic was the use of reasoning to draw logical consequences from premises that are generally accepted opinions. What kind of activity was this? It seems to be an art of the gadfly. The best example we can seem to come up from the ancient world with is the critical use of argumentation by Socrates, as portrayed in the Platonic dialogues. Socrates questioned the opinions of those who thought themselves to be wise, and were assumed to be wise by others or the majority. He also probed and questioned conventionally accepted views. He often drew contradictions and logical problems from these views, using logical reasoning. His method was of asking a sequence of questions, where each question is based on the previous answer given by a speech partner.

The ancients attached quite a lot of importance to dialectic as an art. In addition to its use to teach skills of arguing, and for arguing in casual conversations, Aristotle even saw dialectic as being useful for questioning and discussing the axioms or first principles (archai) of the sciences (*Topics*, 101M). This idea is simply not acceptable to the modern way of thinking since the

so-called Enlightenment. Pascal and Descartes argued that the model of good reasoning should be that of Euclidean geometry, where theorems are rigorously deduced from self-evident axioms. This paradigm of scientific reasoning as the all-powerful method of reasoning represents the modern way of thinking, where it is assumed that, time and time again, science has proved "common sense" to be wrong. The idea of some kind of reasoning outside science, being brought to bear on science and used to question or criticize the assumptions of science, where such critical argumentation commands rational assent, is alien to our modern ways of thinking. The ancient art of dialectic had no place in the modern way of thinking. When ancient logic was rediscovered in the middle ages, it was Aristotle's theory of the syllogism (deductive reasoning) that came to dominate as the paradigm of logical argumentation. Aristotle's fallacies retained a toe-hold in the logic textbooks, but was never again taken seriously as a central part of logic. When the Stoic logic of propositions was formalized around the beginning of the twentieth century, deductive formal logic eclipsed all other branches of the subject. Dialectic was a lost art.

4. Types of Dialogue

The new dialectic is built on the pragmatic foundation introduced by Grice, in his famous paper on the logic of conversation (1975). According to Grice, an argument should be seen as a contribution to a conversation between two parties, and should be evaluated as a good (useful) argument or not, on the basis of whether it made a collaborative contribution to the moving forward of the conversation towards its goal. This new approach was tied in much more closely to how we use and judge arguments in everyday conversational exchanges. The argument was now to be evaluated with respect to how it was used for different purposes in different types of conversational exchanges. But what are these different types of exchanges, and what are their goals? By specifying the precise rules and goals of the different types of conversational exchanges, *The New Dialectic* (1998) offered a new method for evaluating arguments that could be applied to the informal fallacies (sophistical refutations) that held such a place of importance in the early applied logic of Aristotle.

By going back to the Aristotelian roots of logic as an applied, practical discipline, the new dialectic brought out and formulated, in modern terms adequate for state of the art argumentation theory, many of the leading ideas expressed in the ancient works on dialectical argument that heretofore appeared obscure, and were for so long treated as peripheral in logic. For the first time it becomes possible to apply objective logical standards of evaluation to

arguments in everyday conversational exchanges on controversial topics where real conflicts of opinions exist.

The new dialectic offers a framework of rationality for judging an argument as correct or incorrect insofar as it has been used adequately or not in a given case to contribute to goals of dialogue appropriate for the case. An argument is judged to have been used in a fallacious way in a dialogue insofar as it has been used in such a way as to impede the goals of the dialogue. A dialogue, to use our generic term, or a conversation to use Grice's term, is defined as a goal-directed conventional framework in which two speech partners reason together in an orderly way, according to the rules of politeness, or normal expectations of cooperative argument appropriate for the type of exchange they are engaged in. Each type of dialogue has distinctive goals, turn-taking moves, and methods of argumentation used by the participants to work towards these goals together.

Six basic types of dialogue are described in the new dialectic - persuasion dialogue, the inquiry, negotiation dialogue, information-seeking dialogue, deliberation, and eristic dialogue.

TYPES OF DIALOGUE

Type of Dialogue	Initial Situation	Participant's Goal	Goal of Dialogue
Persuasion	Conflict of Opinions	Persuade Other Party	Resolve or Clarify Issue
Inquiry	Need to Have Proof	Find and Verify Evidence	Prove (Disprove) Hypothesis
Negotiation	Conflict of Interests	Get What You Most Want	Reasonable Settlement that Both Can Live With
Information-Seeking	Need Information	Acquire or Give Information	Exchange information
Deliberation	Dilemma or Practical Choice	Co-ordinate Goals and Actions	Decide Best Available Course of Action
Eristic	Personal Conflict	Verbally Hit Out at Opponent	Reveal Deeper Basis of Conflict

Table 1

Each of these types of dialogue is put forward in the new dialectic as a normative model which specifies broadly how a given argument should be used, in one of these contexts, in order to be correct, or to be defensible against the criticism that it is incorrect, erroneous or fallacious. The most central type of dialogue, for the typical purposes of applied logic as it is taught in classrooms today, in courses of critical thinking, is the persuasion dialogue. In this type of dialogue, the proponent has a particular thesis to be proved, and the respondent has the job of casting doubt on that thesis by raising questions about it. In some instances however, the dialogue can be symmetrical. Both participants have a thesis to be proved, and each has the aim of persuading the other to accept his or her thesis. In a persuasion dialogue, each party takes the initial concessions of the other as premises, and then by a series of steps, tries to use these premises in arguments designed to persuade the other party, by means of using rational argumentation, to give up his original thesis.

One very common problem is that during the sequence of argumentation, the dialogue may shift from a persuasion dialogue to another type of dialogue, say to a negotiation or a quarrel. Such dialectical shifts can be very confusing, and are associated with many of the major informal fallacies. Another problem associated with the job of evaluating many common arguments is to apply the dialectical method to cases of mixed discourse, like sales pitches, political debates, and legal arguments in trials. Such cases are characterized by the mixing of two or more types of dialogue. They also frequently involve dialectical shifts from one type of dialogue to another, during the same sequence of argument.

5. Presumptive Reasoning

Recent concerns with the evaluation of argumentation in informal logic and speech communication have more and more begun to center around non-demonstrative arguments that lead to tentative (defeasible) conclusions, based on a balance of considerations. Such arguments do not appear to have structures of the kind traditionally identified with deductive and inductive reasoning. However, they are extremely common, and are often called "plausible" or "presumptive," meaning that they are only tentatively or provisionally acceptable, even when they are correct. These arguments shift a weight of evidence to one side of a balance, thus supporting a conclusion that was previously in doubt. But such a weight can, as the argument continues, be shifted back to the other side.

Presumptive reasoning is based on pragmatic implicatures drawn out by a hearer on the basis of what a speaker's remarks can normally be taken to imply

in the context of an orderly, cooperative dialogue. Hence presumptive reasoning is more subject to contextual interpretation, and also more subject to defeat (and error) than logical reasoning of the more familiar deductive and inductive sorts. Perhaps for these reasons, presumptive reasoning has generally been ignored in logic, and excluded from serious consideration as inherently "subjective," in the past. However (Walton, 1996) shows that the inference structures of presumptive reasoning are well worth investigating, and do help us to critically evaluate argumentation of the kind that powerfully influences people in everyday speech, on all kinds of controversial issues where presumptive conclusions are drawn.

What kind of support is given to a conclusion on the basis of presumptive reasoning? The kind of support given is different from that given by a deductively valid argument or an inductively strong argument. For logicians long accustomed to working with deductive and inductive standards of argument support, the move to a third standard is not easy to make, especially when the new standard typically gives only a weaker kind of support that is tentative in nature, and subject to withdrawal in many instances.

One way to introduce the new idea is through the idea of a generalization. In deductive logic, the universal quantifier is used to stand for a kind of generalization, 'For all x , if x has property F then x has property G ', in which a single counter-example defeats the generalization. This type of generalization could be called absolute, in the sense that it is equivalent to 'There are (absolutely) no x such that x has F , but does not have G .' In contrast, inductive generalizations, of the form 'Most, many, or a certain percentage (expressed numerically as a fraction between zero and one) of things that have property F also have property G '. This kind of generalization is not absolute, because it allows for a certain number of counter-examples (but not too many).

The kind of generalization characteristic of presumptive reasoning is based on a type of generalization of the form, 'Normally, but subject to exceptional cases, if something has property F , it may also be expected to have property G .' This kind of conditional is subject to defeat in unusual or unexpected situations that are not normal, or what one would normally expect. Our confidence in it is tentative, because, as we find more out about a situation, it can come to be known that it differs from the normal type of situation. For example, we normally expect that if something is a bird, it flies. But in a particular case, we may find out that Tweety, a bird, is a penguin, or has a broken wing. This new information will defeat the inference based on the normal presumption that Tweety, since he is bird, is an individual that flies.

Many (statisticians, in particular) feel that presumptive reasoning can be shown to be a species of inductive reasoning, perhaps so-called "subjective

probability". This claim appears dubious, because encountering something that is not normal (and is an exception) in a particular case is often a surprise, and does not appear to be based on statistical regularities. However, it should not be entirely rules out, perhaps, that some sort of statistical model of inference may be found that fits presumptive reasoning. So far, however, no numerical formula for evaluating presumptive reasoning appears to have been found, or at least any criterion that fits all kinds of cases.

Presumptive reasoning is highly familiar in computer science, where it is frequently identified with abductive inference, or what is often called "inference to the best explanation". But abductive inference does not appear to be the same thing as presumptive reasoning, even though the two kinds of reasoning appear to be closely related. The terminology on these questions is not settled yet, and there are many different theories about how these two kinds of reasoning are related.

6. Abductive Inference

What is called abductive reasoning in computer science, or "inference to the best explanation" in philosophy, is a distinctive kind of inference that goes from given data to a hypothesis that best explains the data. An example from ordinary conversation is given by Josephson and Josephson (1994, p. 6)

Case 2

Joe : Why are you pulling into this filling station?

Tidmarsh : Because the gas tank is nearly empty.

Joe: What makes you think so?

Tidmarsh : Because the gas gauge indicates nearly empty. Also, I have no reason to think that the gauge is broken, and it has been a long time since I filled the tank.

Classified as an argumentation scheme, we would say that the argument in this case is an instance of argument from sign. The gas gauge indicating "nearly empty", or being low, is a sign that the tank is nearly empty. Giving such a sign or indication is what this instrument is designed for. But we can also see the reasoning as an inference to the best explanation. Tidmarsh considers two possible explanations for the indication on the gas gauge. One is that the gas is low. The other is that the gauge is broken. But, as he says, there is no reason to think that the gauge is broken. So the best explanation, from what is known in the case, is that in fact the gas in the tank is nearly empty.

Abductive reasoning is common in science (Josephson and Josephson, 1992, p. 7). Some would even argue that the typical type of reasoning to a

scientific hypothesis from given data is abductive in nature. According to Harman (1965), when a scientist infers the existence of atoms, she is reasoning from the best explanation of the given scientific data. Peirce (1965, p. 375) classified all inference as falling into three classifications - deduction, induction, and what he called "hypothesis", which corresponds to abductive inference. Peirce, in a work called 'The Proper Treatment of a Hypothesis' (Eisele, 1985, pp. 890-904) described abduction as a kind of guessing, characteristic of scientific reasoning at the discovery stage, which can save experimental work by narrowing down the possible hypotheses to be tested to the most plausible candidates. Peirce clearly identified abductive reasoning as a distinctive type of inference that is important in science, and described it as a kind of plausible reasoning or "guessing" (Eisele, 1985, p. 898). He also frequently wrote about abduction as a kind of "explaining" process in 'The Proper Treatment of a Hypothesis' (Eisele, 1985, p. 899). Peirce (1965, p. 375) defined hypothesis as occurring in the following kind of instance: "where we find some very curious circumstance, which would be explained by the supposition that it was a case of a certain general rule, and thereupon adopt that supposition." He gives the following two examples (p. 375).

Case 3

I once landed at a seaport in a Turkish province; and, as I was walking up to the house which I was to visit, I met a man upon horseback, surrounded by four horsemen holding a canopy over his head. As the governor of the province was the only personage I could think of who would be so greatly honored, I inferred that this was he. This was an hypothesis.

Case 4

Fossils are found; say, remains like those of fishes, but far in the interior of the country. To explain the phenomenon, we suppose the sea once washed over this land. This is another hypothesis.

Case 4 is clearly an example of a scientific kind of hypothesis, while case 3 is the kind of inference to the best explanation that is so common in everyday reasoning. These two cases illustrate very well how presumptive reasoning is typically based on a kind of inference to the best explanation that Peirce called "hypothesis" or abductive inference.

One thing that is very interesting about abductive reasoning is that it combines the two functions of argument and explanation. An abductive inference may be used as an argument to support a conclusion, but the basis of that support utilizes an explanation, or a series of explanations. We normally think of argument and explanation as two different speech acts, or uses of

discourse. The purpose of putting forward an argument to a hearer is normally to prove some proposition that is in doubt to the hearer. The purpose of offering an explanation of to a hearer is to take a proposition that both the speaker and hearer presume is true, and to make it understandable to the hearer. These two speech acts are inherently different, but in abduction they are combined. The explanation function is part of what supports or makes possible the carrying out of the argument function. The distinction is often explained in computer science as one of the direction of the reasoning. Normally, the reasoning in an argument moves forward. That is, the inference goes from the premises to the conclusion. But in abductive reasoning, there is also a backwards movement of inference. The conclusion is taken as a given data, and then a search back is made to try to determine the best explanation for this data.

The general form an abductive inference can be represented as follows - compare (Josephson and Josephson, 1994, p. 14).

Form Abduct:

D is a collection of data.

Hypothesis *H* explains *D*.

No other hypothesis explains *D* as well as *H*.

Therefore *H* is plausibly true (acceptable).

Another kind of scientific reasoning that has been recognized as being based on abductive inference is medical diagnosis,, a species of argumentation from sign that reasons from the given data to the best explanation. For example, in the case of a diagnosis of measles, the physician might reason as follows.

Measles:

If the patient has red spots, then the patient has measles.

The patient shows red spots.

Therefore, the patient (plausibly) has measles.

The conclusion drawn in the Measles Case is tentative, and based on the assumption that there is no better explanation of the red spots. The converse of the major premise, 'If the patient shows red spots, the patient has the measles' is not true, since showing red spots is only one sign of having the measles, and it is not a conclusive sign, by any means. It is just one sign that can be used abductively as evidence for measles, in the absence of any better explanation of the red spots. At any rate, it is this sort of case analysis that is the basis of the often-expressed theory that abductive reasoning takes the form of argument called affirming the consequent. This analysis has its tricky aspects, however,

and the reader might be referred to (Walton, 1996b, pp. 264-281) for a fuller discussion of the forms of abductive inference and argumentation from sign.

Josephson and Josephson (1994, p. 266) report that use of a seven-step scale of plausibility values worked very well in modeling plausible reasoning in medical diagnostic systems. Such use of numerical values might suggest that plausible reasoning could be formalized using the probability calculus. But they report (p. 268) that interpreting plausibility as probability just didn't work out very well. After going into the various technical possibilities in such a modeling, they conclude (p. 269) that there is no "significant computational payoff" in it. They conclude (p. 270) that there is "a need to go beyond probability", and look in some other direction for a way to model plausible reasoning. They conclude (p. 272) that is unlikely that plausibility, of the kind characteristic of abductive reasoning, can ever be quantified, in the way that probability is quantified in the probability calculus. To make "smart machines" that can reason plausibilistically, they conclude, we need to go in a different direction.

How is one to judge, by some clearly defined standard, whether a particular presumptive inference is structurally correct or not, in a given instance? This has become an extremely important question in recent times, and could even rightly be called the central question of argumentation theory. The problem is that while we in the field of logic are highly familiar with deductively valid forms of argument, and somewhat familiar with inductively strong forms of argument, we appear to lack forms of argument corresponding to cases of presumptive reasoning. However, there is a literature on what are called argumentation schemes.

7. Argumentation Schemes

Argumentation schemes are the forms of argument (structures of inference) that enable one to identify and evaluate common types of argumentation in everyday discourse. In (Walton, 1996), twenty-five argumentation schemes for presumptive reasoning are identified. Matching each argumentation scheme, a set of critical questions is given. The two things together, the argumentation scheme and the matching critical questions, are used to evaluate a given argument in a particular case, in relation to a context of dialogue in which the argument occurred. An argument used in a given case is evaluated by judging the weight of evidence on both sides at the given point in the case where the argument was used. If all the premises are supported by some weight of evidence, then that weight of acceptability is shifted towards the conclusion, subject to rebuttal by the asking of appropriate critical questions.

One premise of an argumentation scheme typically takes the form of a presumptive generalization, of the kind described above, to the effect that if x has property F , then normally x will also have property G . For example, the argumentation scheme for argument from sign is the following (Walton, 1996, p. 49)

A is true in this situation.

B is generally indicated as true when its sign, A , is true, in this kind of situation.

Therefore, B is true in this situation.

The second premise is a presumptive generalization which says that if A is true, then generally, but subject to exceptions, B is also true. But such a generalization is defeasible. It, taken with the other premise of the scheme, shifts a weight of acceptance to the conclusion. But counter-argumentation in a case may subsequently overturn acceptance of the argument by withdrawing that weight, or even introducing new evidence that places a weight against it.

The list of presumptive argumentation schemes given in (Walton, 1996) offers a useful, modern, accessible, systematic and comprehensive account that the reader can use as an aid in interpreting, analyzing and evaluating natural language argumentation in everyday conversations. Perelman and Olbrechts-Tyteca (1958) identified many distinctive kinds of arguments used to convince a respondent on a provisional basis. Arthur Hastings' Ph.D. thesis (1963) made an even more systematic taxonomy by listing some of these schemes, along with useful examples of them. Recently Kienpointner (1992) has produced an even more comprehensive outline of many argumentation schemes, stressing deductive and inductive forms. Among the presumptive argumentation schemes presented and analyzed in (Walton, 1996) are such familiar types of argumentation as argument from sign, argument from example, argument from commitment, argument from position to know, argument from expert opinion, argument from analogy, argument from precedent, argument from gradualism, and the slippery slope argument. Helpful examples of each type of argumentation are given and discussed. In other recent writings on argumentation, like van Eemeren and Grootendorst (1992), there is a good deal of stress laid on how important argumentation schemes are in any attempt to evaluate common arguments in everyday reasoning as correct or fallacious, acceptable or questionable.

The exact nature of the relationship between argument from sign and abductive inference is an interesting question. The measles inference above is clearly an instance of argument from sign, and it is also an instance of abductive inference, or inference to the best explanation. Many instances of argument

from sign can also be very well analyzed as cases of inference to the best explanation. Consider the example of argument from sign cited in (Walton, 1996, p. 47).

Case 5

Here are some bear tracks in the snow.

Therefore, a bear passed this way.

In this case, the premise is based on the observing of a particular shape and appearance of imprints in the snow identified as a bear tracks. The best explanation of the existence of such tracks would be (in the right context) that a bear passed this way. But not all cases of argument from sign appear to fit the inference to the best explanation format this well. For example, dark clouds could be a sign of rain, but can we say that the rain is the best explanation of the dark clouds? Not without some twisting and stretching, which leads one to suspect that not all cases of argument from sign fit the abductive model. Nonetheless, it is clear that abductive inference and argument from sign are very closely related.

8. Arguments from Ignorance

A useful and encouraging aspect of the new dialectic is that it shows how the presumptive argumentation schemes are the essential underlying structure needed for the analysis of the traditional informal fallacies. Govier (1988, p.34) has rightly stressed that the fallacies approach to argument evaluation is incomplete, precisely because it needs to be based on a prior understanding of the various types of good argument involved. She notes that the traditional fallacies are most often based on good arguments that are not "propositionally valid", but nonetheless represent "ways of arguing well". Not knowing exactly what these "ways" are has been the biggest obstacle to the analysis of the fallacies. This new dialectic represents a breakthrough by showing exactly what these ways of arguing well amount to. Three important informal fallacies that have been analyzed in depth by the dialectical method elsewhere can be used to illustrate this point. These three are: argument from ignorance (*argumentum ad ignorantiam*), hasty generalization (*secundum quid*), and argumentation from consequences (*argumentum ad consequentiam*).

The argument from ignorance has the following simple form: it has not been shown that propositions *A* is true, therefore it may be presumed that *A* is false. To see how common this type of inference is, consider the following dialogue.

Case 6

Bob: Is Leona Helmsley still in jail? She's probably out by now.

Helen : Maybe she's still in there, because we'd probably hear about it if she got out.

How the argument from ignorance is used in this dialogue can be better understood by placing it in the following sequence of reasoning: (1) we would probably hear about it if Helmsley got out (because the story would be widely reported in the media), but (2) we haven't heard about it, therefore (3) she's probably not out, i.e. (4) she's still in there. Neither Bob nor Helen has any definite evidence, one way or the other, yet Helen's presumptive inference that "Maybe she's still in there." seems to justify the drawing of a reasonable conclusion by default. It is more of a conjectural than a solid conclusion, but it would seem to be an exaggeration to call her argument fallacious. It is an argument from ignorance that can be evaluated within the context of dialogue in which it was used in the above case, as a nonfallacious use of presumptive reasoning.

In the standard treatment of the logic textbooks, this type of argument has traditionally classified as a fallacy. But in this case, and in many other cases studied in (Walton, 1996a), the argument is evaluated dialectically as a presumptively reasonable argument that could function as tie-breaker in a balance-of-considerations case, thereby being used to draw a justifiable conclusion in a dialogue.

The argument from ignorance still continues to be condemned as a fallacy by many commentators. Gaskins (1992) portrays it as a powerful and all-pervasive argumentation strategy used especially influentially in modern discourse to base conclusions on suspicion about all forms of authority. According to Gaskins, the skillful modern advocate uses the following form of the argument from ignorance: "I win my argument unless you can prove me wrong." According to Gaskins, this fallacious form of argument has come to dominate not only legalistic argumentation, but also scientific inquiry, and modern moral disputes on public policy.

However, the argument from ignorance has had powerful defenders. Socrates, in the *Apology*, was allegedly told by the Oracle at Delphi that he was the wisest man of all, because he was the only one who admitted his ignorance. Here a subtle form of ignorance, knowing what you do not know - was used as a premise to support the conclusion that awareness of limitations could be a kind of wisdom. Recently, Witte, Kerwin and Witte (1991) have championed this Socratic attitude of trying to teach medical students an awareness of the limitations of medical knowledge, instead of the more usual me-

thod of instruction, which they see as dogmatic memorizing of facts, as a better method of medical education. They have set out a Curriculum of Medical Ignorance that advocates use of the argument from ignorance as a model of medical reasoning.

Another common use of the argument from ignorance is in computer science. It is a very familiar kind of reasoning in this area to search through a knowledge base, find that a particular proposition sought for is not there, and then presumptively conclude that this proposition is false. This is called default reasoning in computer science. A familiar example (Reiter, 1987) similar to case 1 would be the kind of case where you look at an airport monitor listing all the stops on a flight between Vancouver and Amsterdam, and you see that Winnipeg is not listed as one of the stops. When you infer that the plane does not stop at Winnipeg, you are using an *argumentum ad ignorantiam*. But this argument could be reasonable, assuming the convention that all stops are listed on this monitor (what Reiter calls the closed world assumption).

The dialectical examination of the argument from ignorance, indicated by the cases above, suggest that in many cases, it is a reasonable argument that has legitimate and common uses in scientific and medical reasoning, and in the kind of knowledge-based reasoning common in computer science. It can also be shown to commonly used, and quite reasonable in many cases, in legal reasoning, where, for example, it is reflected in the basic principle of criminal law that a person should be presumed to be not guilty, in the absence of proof of guilt.

9. Applying the New Dialectic to Cases

In the new dialectic, each case is unique, and a given argument needs to be judged on the basis of the text of discourse available, representing the information in that case. To evaluate the argument, we have to ask whether the closed world or the open world assumption is appropriate. And we have to ask what type of dialogue the participants were supposedly engaged in, as far as the information given in the case indicates. If these facts are not determined by the information given in the case, then the best we can do is to evaluate the case hypothetically, based on assumptions that may hold or not, from what we know about the case. Any assessment of this kind is contextual. We have to look at the case as a whole, and then evaluate the argument in light of how it was used in that case, as far as we can determine the relevant details of the case.

A dialectical assessment of a particular argument as used in a case appears to be quite different from the usual use of deductive logic to assess whether a given argument in natural language is valid or invalid. But it may not be as

different as is widely assumed. Even so, formal treatment would appear to be more limited in the dialectical assessment, because in many cases of everyday conversational exchanges, there is little or no explicit agreement between the participants on exactly what type of dialogue they are supposed to be taking part in. Political argumentation, for example, is typically mixed, being partly persuasion dialogue, but also partly negotiation and eristic dialogue (as well as involving information-seeking dialogue and deliberation, in many cases). Even so, each type of dialogue does have a formal structure, and once the argument is modeled in a given structure, formal techniques, of the kind currently in use in *AI*, can be brought to bear on it. Nonexplicit premises can be articulated, and so forth. Formalization is both possible and helpful, but since the data in a case can be massive, how the formal structure is to be applied to the known data in a case requires considerable preparatory work in interpreting what the text of discourse should be taken to mean, in a given case.. So here is the problem. It is not so much a problem of any difficulties of formalization, as it is a problem of determining the body of data one takes to be the case.

The new dialectic has many uses. But among the foremost of these uses is that of evaluating an argument found in a given text of discourse in a specific case. Logic has long dealt with the evaluation of such arguments, but the assumption has always been that the argument is just a designated set of propositions - a set of premises and a conclusion - and that everything else about it is trivial or unimportant from a viewpoint of its logical evaluation. In the new dialectic, what is now important is not only the set of propositions, but the context of dialogue in which these propositions have (presumably) used for some purpose. Now each case needs to be looked at with respect to the argument is supposedly being used - is it being used to persuade, to negotiate, or to deliberate, for example? The same argument could be seen as quite reasonable if it was supposed to a negotiation tactic, whereas it could be rightly judged to be fallacious if supposedly used as a contribution to a critical discussion on some specific issue. For example, the same threat that is relevant in a negotiation dialogue could be irrelevant if used as an argument if it is supposed to be part of a critical discussion.

The first task in evaluating any given argument in a text of discourse is to identify the sequence of reasoning using an argument diagram to pinpoint each proposition, and to identify the inferences drawn from such propositions to the conclusions that were derived. This task requires the filling in of nonexplicit premises and conclusions. Hence the context of dialogue is vitally important even at this stage, because judging how to charitably fill in such missing links should be guided by dialectical factors, like the arguer's commitments, as known in the case. Once agreement is reached on what the premises and

conclusions of the given argument are supposed to be, as judged from the textual and contextual evidence of the case, the next step is to examine each inference in the chain of reasoning. Where weaknesses are found, the appropriate critical questions need to be asked. Then finally, looking over the whole sequence of reasoning exhibited in the diagram, the question of relevance needs to be raised. Where is the argument leading? Is it leading towards the ultimate conclusion that is supposed to be proved in the type of dialogue exchange of which it is supposedly a part? These are the questions relating to dialectical relevance.

10. Uses of the New Dialectic

The new dialectic offers a practical method of identifying, analyzing and evaluating authentic cases of everyday argumentation that does not require an abstraction from the realities of discourse in a natural language setting. A new option is offered. No longer do arguments have to be judged solely in relation to standards of deductive and inductive reasoning. In the past, the dominance of this more restrictive approach has led to a distorted view of many everyday, presumptive arguments, often leading to the conclusion that such arguments are somehow inherently defective, or even fallacious. In the new dialectic, the different contexts of use of such arguments are taken into account - included are such factors as the type of dialogue, the stage of a discussion, the commitments of the discussants, and other factors that are specific to a case of argumentation in which two speech partners are attempting to reason together for some collaborative purpose. The targeting of the new dialectic to factors of how an argument was used in a specific case gives a more practical way of evaluating everyday argumentation. Judged by such practical standards, an argument can be evaluated as weak in certain respects, and open to appropriate critical questions, without being so badly off that it should be condemned as fallacious, implying an error or defect that is beyond repair. As well as providing new tools for the analysis of arguments by teachers of courses on critical thinking and informal logic, the new dialectic has other important fields of application. It is clearly applicable to many common kinds of arguments, and problems of argumentation, in fields like artificial intelligence, experts systems, legal and medical reasoning, and use of evidence in academic research (not excluding scientific argumentation).

The new dialectic is a framework for reasoning that strikes a healthy balance between descriptive empirical research on argumentation and normative or abstract logical methods of setting standards for good arguments. Such a balance, although lacking in the past, is healthy because neither the empirical

or the normative approach, by itself, can provide a method of argument evaluation that is both objective in standards and that fits the realities of real cases of argumentation in a way that is practically useful. Real arguments in conversational exchanges are mixtures of different types of dialogue, and have different standards of plausibility and rationality. Each type of dialogue has its own distinctive goals, its own procedural rules, and its own standards of burden of proof. An argument that could be appropriate and reasonable might be highly inappropriate, or even fallacious, in another type of dialogue. Cases also frequently involve mixtures of two or more types of dialogue, and shifts from one type of dialogue to another. In the new dialectic, judging how an argument was used in a given case is a contextual matter. Much depends on what type of dialogue the participants were supposedly engaging in, when the argument in question was put forward by one of the parties in the discussion. The evidence on which to judge a case, therefore, must be sought in the context of use of the argument. As shown in section nine above, sometimes there is plenty of such evidence available in a given case, but in other cases, the best that can be done is to make a conditional evaluation of the case, based on what evidence is given in that case. Such conditional evaluations, despite their hypothetical and incomplete nature, can, in many cases, be extremely helpful in diagnosing the logical strengths and weaknesses of an argument.

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