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HOW TO EVALUATE ARGUMENTATION USING SCHEMES, DIAGRAMS, CRITICAL QUESTIONS AND DIALOGUES

This paper presents some tools that can be used to identify analyze and evaluate argumentation. The example considered is the argumentation scheme for appeal to expert opinion, along with its set of matching critical questions. It is shown how arguments can be diagrammed to identify missing premises and to exhibit the role of the scheme in the argumentation. The asking of a critical question shifts weight of presumption back to the arguer so that her argument is defeated unless the question is answered. But there are some problems here that need to be studied, for some critical questions need support before they defeat an argument. One of the main problems studied is how such an argument can ever be closed off, or commitment to its conclusion made final, given that questioning of it can go on and on in a dialogue. In some case, is argued, a meta-dialogue needs to be inserted to resolve the issue of which side has the burden of proof.

Keywords: argument from expert opinion, commitment rules, formal dialectic, profiles of dialogue, critical questions, burden of proof, multi-agent systems, defeasible reasoning, legal argumentation, meta-dialogues.

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1. Argumentation Schemes

Certain common forms of argument have been formalized as argumentation schemes (Hastings 1963; van Eemeren and Grootendorst 1984; Kienpointner 1992; Walton 1996). Especially interesting are the presumptive schemes, where the premises do not imply the conclusion either by deductive or inductive inference. 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. Presumptive argumentation schemes are defeasible, meaning that that they hold only tentatively and can fail or "default" as new evidence comes in. A main problem is how defeasible argumentation schemes are rationally binding. For example, argument from expert opinion is often reasonable, but has been traditionally studied in logic under the heading of the *argumentum ad verecundiam* fallacy. A problem posed is to grasp how an argumentation scheme that is neither deductively valid nor inductively strong can be binding. If the person to whom the argument was directed accepts the premises, and the argument has the form of an argumentation scheme, how does the argument compel him rationally to accept the conclusion?

Argumentation schemes represent common forms of argument used in everyday discourse, and in special contexts like scientific and legal argumentation. Some forms of argument like *modus ponens* and disjunctive syllogism are familiar from deductive logic. Inductive forms of argument are known in probability and statistics. But many of the most common and interesting argumentation schemes are neither deductive nor inductive. They are based on generalizations and warrants that are not absolutely tenable, and are subject to exceptions. They tend to be useful in situations of uncertainty where knowledge is incomplete. They easily go wrong, or can be used as deceptive tactics, and historically they have mainly been known in logic under the heading of fallacies. However

Aristotle identified positive forms of argument corresponding to many of these defeasible argumentation schemes in his *Topics, On Sophistical Refutations* and *Rhetoric*, calling them "topics" (*topoi*) or places. However, the role of the topics remained marginal in logic for two millennia (Kienpointner 1997).

Perelman and Olbrechts-Tyteca, in *The New Rhetoric* (1969) identified and defined many distinctive kinds of arguments used to convince a respondent on a provisional basis. Argumentation schemes are argument forms that represent inferential structures of arguments used in everyday discourse, and in special contexts like legal argumentation, scientific argumentation, and especially in AI. Most of us are familiar with forms of inference like *modus ponens* and disjunctive syllogism in deductive logic. While some of the most common and interesting argumentation schemes are neither deductive nor inductive, but defeasible and presumptive, may not be familiar with these. To introduce them, some background may be useful.

Hastings (1963) must be credited with presenting the first systematic identification and analysis of many of the most common defeasible argumentation schemes, and for presenting them in a format that enables them to be evaluated as arguments. Hastings presented a set of critical questions matching each argumentation scheme. With each scheme, Hastings presented one premise as a conditional formulated as a Toulmin warrant, indicating the defeasible nature of the argumentation. Perelman and Olbrechts-Tyteca, in The New Rhetoric (1969) also identified and studied many of these defeasible argumentation schemes, including some new ones. The role of argumentation schemes is also central in the work of van Eemeren and Grootendorst (1984; 1987; 1992). There are two recent monographs that identify and analyze many common argumentation schemes, (Kienpointner 1992) and (Walton 1996).

To illustrate how argumentation schemes work, the example of appeal to expert opinion is used here. This form of argument, called "appeal to authority" had long been taken to be a fallacy. But in fact, appeal to expert opinion is a very common form argument, especially in legal argumentation. So much legal evidence is based on the testimony of expert witnesses these days, like DNA evidence for example, that one is easily made to concede that this form of argumentation, while fallible, is by no means always fallacious. The following argumentation scheme for appeal to expert opinion was presented in (Walton 1997: 210).

Argumentation Scheme for Appeal to Expert Opinion

Major Premise: Source E is an expert in subject domain S containing proposition A.

Minor Premise: E asserts that proposition A (in domain S) is true (false).

Conclusion: A may plausibly be taken to be true (false).

One can easily see from the argumentation scheme for appeal to expert opinion that it represents a defeasible form of argument. Although there is a natural tendency to defer to experts, experts are often wrong, and appeal to expert opinion should not be taken as a substitute for objective or experimental evidence when it is available. Thus appeal to expert opinion is best evaluated as a defeasible form of argument that should be subject to critical questioning. The following six basic critical questions are proposed in (Walton 1997: 223). A is a statement (proposition). E is an expert in particular field, representing a domain of knowledge.

Basic Critical Questions for Appeal to Expert Opinion

1. *Expertise Question*: How credible is E as an expert source?
2. *Field Question*: Is E an expert in the field that A is in?
3. *Opinion Question*: What did E assert that implies A?
4. *Trustworthiness Question*: Is E personally reliable as a source?
5. *Consistency Question:* Is A consistent with what other experts assert?
6. *Backup Evidence Question*: Is E's assertion based on evidence?

2. Argument Diagramming

A widely used method called argument diagramming is helpful in analyzing and evaluating arguments in given texts of discourse. This method can be used to identify premises and conclusions in sequences of argumentation and even to mark up the argumentation schemes used to derive each conclusion from a set of premises. *Araucaria* is an automated system of argument diagramming based on an Argumentation Markup Language (Reed and Rowe 2001) that is available at no cost on the internet[1]. The user begins by inserting the text of the argument into

[1] The Araucaria software can be downloaded from the following location on the internet: www.computing.dundee.ac.uk/staff/creed/araucaria/

Araucaria. The next step is to identify each statement that is a premise or a conclusion in the argument by highlighting it. The third step is to use the software to draw lines representing each inference from any set of premises to any conclusion.

Consider the following example of an argument.

The Fat Children Example

Children in North America are unhealthy. They are getting fatter and fatter. They are less and less physically active. They spend too much time on the computer and watching television. They don't walk or bike to school any more. When they are in school, they don't spend enough time in the gym or on the playground. They eat too much junk food. According to Dr. Andrew Blast, director of the Child Health Research Institute, three out of five North American children (aged 5 to 17) eats quantities of junk food that are not healthy for a child's optimal development.

The set of statements that figure as premises or conclusions in this argumentation are represented in the key list below. Some text has been deleted, as it is merely explanatory and does not form premises or conclusions that are part of the argument.

Key List for the Fat Children Argument

(A) Children in North America are unhealthy.

(B) They are getting fatter and fatter.

(C) They are less and less physically active.

(D) They spend too much time on the computer and watching television.

(E) They don't walk or bike to school any more.

(F) When they are in school, they don't spend enough time in the gym or on the playground.

(G) They eat too much junk food.

(H) According to Dr. Andrew Blast, director of the Child Health Research Institute, three out of five North American children (aged 5 to 17) eats quantities of junk food that are not healthy for a child's optimal development.

The next step is to load this set of statements into Araucaria as a text file, where it will appear as text in a box on the left of the screen. As each statement is highlighted, a circled letter corresponding to it will appear in a box on the right. The user then draws a line from each circled number or numbers to each other one that is a conclusion drawn by inference from them. Once all the circled numbers have been connected by lines, the result is an argument diagram. The argument diagram for the fat children example is displayed below.
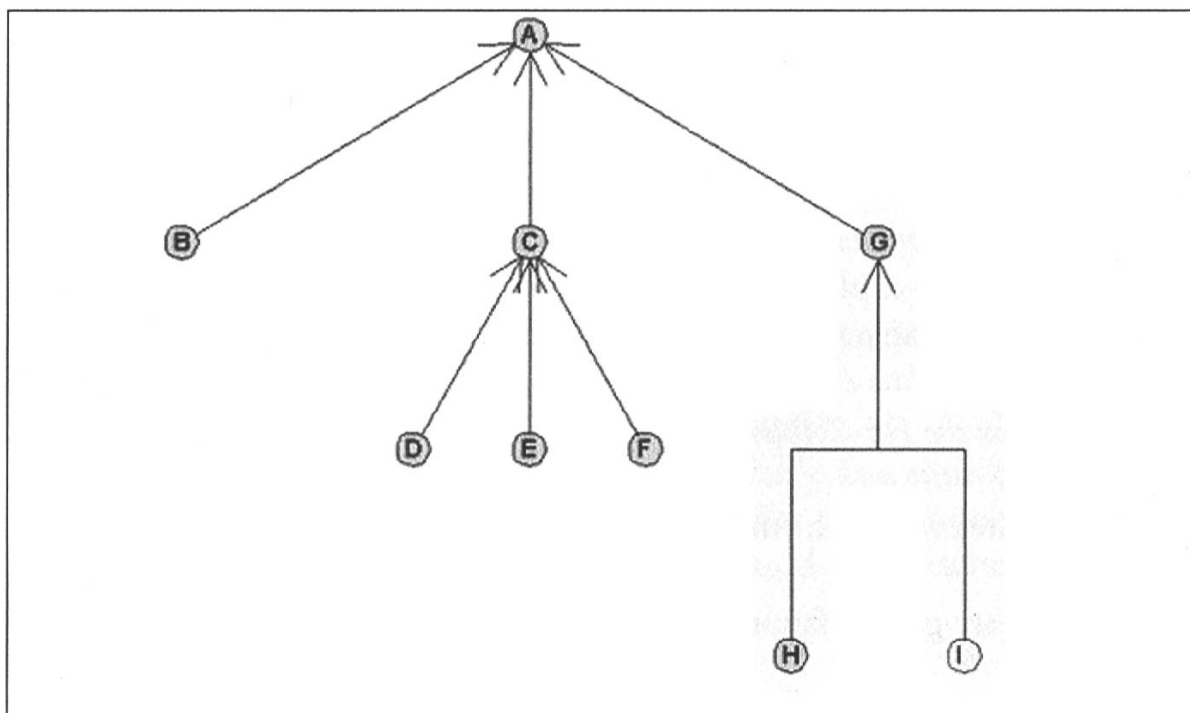
Fig. 1: Diagram of the Fat Childeren Argument

Two special features of the diagram are worth noting. One is that a missing premise (I) has been added. This statement is shaded differently from the other statements. Another is that the area around the argument from H and I to G has been shaded. These features can be explained more easily by examining the full text version of the diagram below. A full text diagram can be produced from an existing diagram by merely clicking on the FULL TEXT tab. The argumentation structure of the full text diagram is the same as that of the original diagram, but it is displayed so that

the text of each statement appears in a box. There are also a couple of other features shown in the full text diagram below.
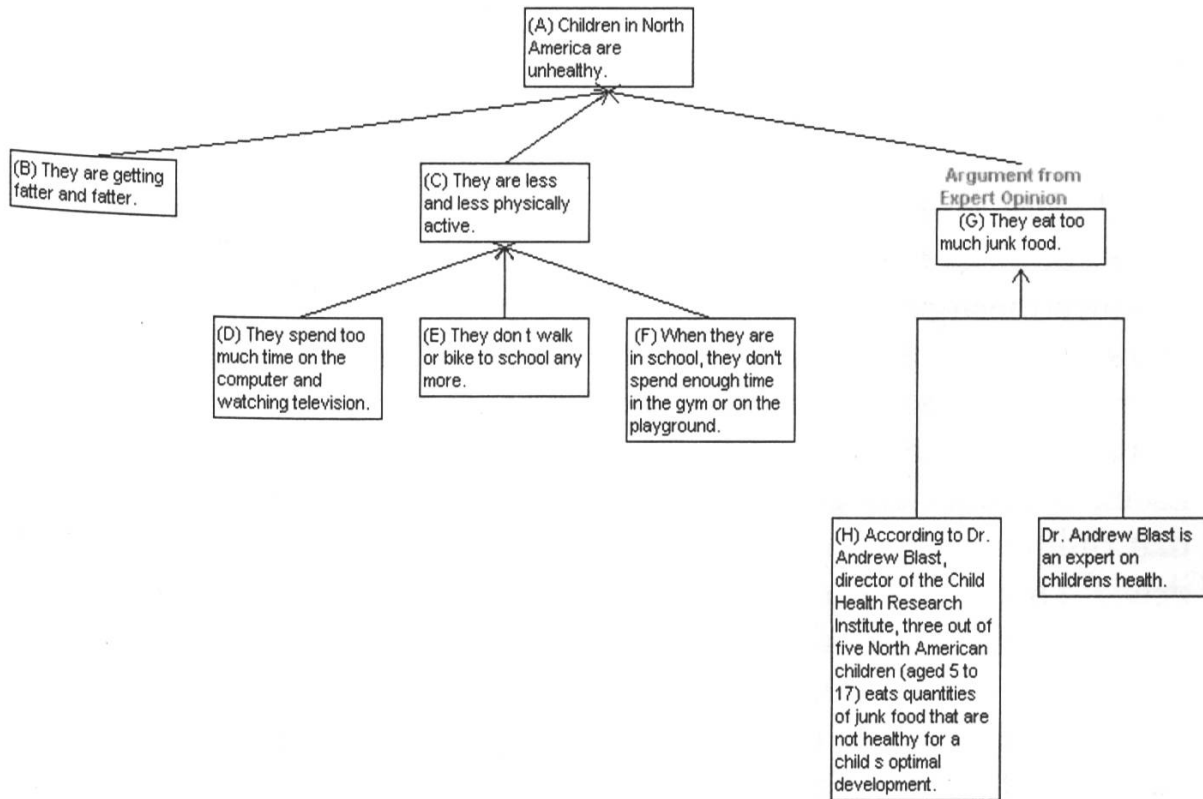
Fig. 2: The Full Text Argument

The missing premise I (Dr. Andrew Blast is an expert on children's health) has been made explicit and inserted in a linked argument supporting conclusion G. A linked argument is one where both (or all) the premises go together to support a conclusion. The other arguments on the diagram are convergent. A convergent argument is one where each premise functions by itself as an independent reason supporting the conclusion.

The method of diagramming is very helpful in a case like the one above because it enables the analyst to organize the argumentation in the given case into a structure in which the propositions in the argument and the inferential structures of the relations on them are displayed. Such a diagram is also useful for the purpose of evaluating the argument. We can see, for example, the role of conclusion G in the argumentation and how G is supported by a missing premise in an argument from expert opinion. Suppose we wanted to evaluate this argument. How could we do it? The device of the critical questions is the most useful tool. We need to ask the right critical questions, and probe into the support for the argu-

ment in a dialogue with the advocate who put the argument forward. But suppose that advocate is not available for questioning. Still, we can express critical questions about the argument, putting it into doubt until these questions are answered. This is the very activity characteristic of argument analysis and evaluation needed in courses on critical argumentation and informal logic.

Still, before any very firm evaluation of the argument can be attempted, more questions need to be answered. What was the goal of the dialogue of which the argument was part? What burden of proof should be appropriate for such a dialogue? The premises seem plausible enough, but they have not really been proved beyond doubt, or even in any scientific way. Perhaps, for example, the argument was part of an editorial on health issues. It could have been just a magazine article arguing to the readers that children in North America are unhealthy by citing some medical evidence. Thus the article could be described as an attempt to persuade the reader that its central thesis, 'Children in North America are unhealthy', although a controversial claim, is one that has some empirical evidence to support it. But the context of dialogue could have other aspects. The claim could be that this unhealthy state of the children is a problem that we need to do something about. In that case, the dialogue would be a deliberation, arguing for a need to take action to solve a problem. The standards of burden of proof for a successful argument might be different, depending on whether the dialogue is meant to be a persuasion dialogue or a deliberation. Thus in order to evaluate arguments in everyday cases, beyond pinpointing weak points in them by asking critical questions, some more systematic attempt must be made to classify the type of dialogue and its goal.

The problem that can be presented now is a general one for the evaluation of argumentation. The argument diagram represents an analysis of the given argument, and presents a visualization of its structure. But it mainly represents the argument as a set of statements, premises and conclusions, along with inferences from statements to other statements. The diagram does not represent the context of dialogue in which the argument was used to prove something or to persuade an opponent to accept a claim. But in some respects the argument diagram does represent dialogue. Once a particular argument identified in the diagram fits a given argumentation scheme, a set of matching critical questions are raised. These pinpoint critical weaknesses in the argument. Unless the questions

are answered or addressed appropriately, the argument is subject to doubt, and it may fail for this reason. Thus each argument diagram contains dialogue nested within the diagram at subarguments that fit an argumentation scheme.

3. How to Formally Define a Dialogue

A dialogue, in the paradigm or basic model, has two participants, often called the proponent and the respondent, who take turns making moves. These moves take the form of speech acts (Jacobs 1989; Singh 1999). For example, asking a question, asserting a statement, or putting forward an argument are typical moves in the most common dialogues. There are actual dialogues like parliamentary debates. But a dialogue can also be defined as a formal structure. A dialogue can be defined formally as a set of participants who take turns making moves according to various rules. There is a set of rules defining permitted types of moves, a set of rules for determining when a move is appropriate in light of prior moves that have been made, and finally, a set of rules determining when a completed sequence of moves fulfills the goal of the dialogue (so-called "win-loss" rules). There are also rules called commitment rules, explained below. In the formal theory of Hamblin (1970; 1971), the proponent makes the first move, the respondent makes the next move, and then the dialogue continues according to the rules, producing an orderly sequence of moves. Each member in the sequence is defined by Hamblin (1971: 130) as a triple, $\langle n, p, l \rangle$ n is length of the dialogue, defined as the number of moves. p is a participant. And l is what Hamblin calls a locution. It is a type of move of the kind nowadays called a speech act. Using Hamblin's notation, a small dialogue with three moves has the following form.

$$\langle 0, P_0, L_4 \rangle, \langle 1, P_1, L_3 \rangle, \langle 2, P_0, L_2 \rangle$$

At move zero, P_0 begins the dialogue by making a move of type 4. At move 1, the other participant P_1 replies by making a move of type 3. And so on. The dialogue can be mapped out as a sequence beginning at move zero and ending a final move. In Hamblin's theory the dialogue contained a sequence of argumentation made up of small connected steps of single arguments, and the purpose was to transfer information. But Hamblin's work was pioneering and he wanted to use formal dialogue structures as a practical method of analyzing fallacies. He clearly realized that there could

be a variety of different kinds of dialogues, but he made no serious general attempt to classify them into different types with specified goals.

Using the above formalization of dialogue structure is necessary for theory, but many of the kinds of actual cases of dialogue we want to study and evaluate may be fragmented and localized in a small conversation. For modeling such cases, there is another structure that can be a very useful tool. It is called the profile of dialogue (Krabbe 1999). A profile of dialogue is a relatively short sequence of connected moves with the proponent's moves paired with those of the respondent. The small profile of dialogue below can serve as an illustration.

Table 1: Small Profile of Dialogue

Proponent	Respondent
1. Why should I accept A?	Because B.
2. Why should I accept B?	Because C.
3. I do not accept C.	Do you accept 'If B then C?'
4. Yes.	Do you accept B?
5. Yes.	Well then you must accept C.

In this example, the proponent asked a why-question at the first move. The respondent's first move was to reply by putting forward an argument by giving a reason why the proponent should commit to the statement A. As the dialogue proceeds, the respondent continues trying to use arguments to get the proponent to commit to A. He uses a *modus ponens* form of argumentation at moves 3-5 to try to get the proponent to commit to C. It is clear that his strategy is to get to get her to commit to B, and ultimately to A.

The small profile of dialogue above looks "logical" in nature. But in addition to their normative aspect, profiles also have a descriptive aspect. What are in effect profiles of dialogue have been shown by Jacobs and Jackson (1982) to be useful tools to analyze argumentation sequences in conversational discourse. When pairs or n-tuples of speech acts like question/answer or offer/accept/decline are conventionally bonded, they are called adjacency pairs. Jacobs and Jackson (1982: 222) showed how adjacency pairs in a conversational exchange can be sequentially expanded to produce a range of socially constructed argumentation patterns. Such standard argumentation sequences are, in effect, profiles of dialogue.

4. Classification of Basic Types of Dialogue

This part of the study begins by presenting classification of different types of dialogue thought to be important for the study of argumentation and informal fallacies. Below there is a classification of six basic types of dialogue thought to be important for the study of argumentation: the persuasion type, the negotiation type, the deliberation type, the inquiry type, the information-seeking type, and the eristic (purely adversarial) type. In addition to the basic types, it is shown how it is possible to have mixed types of dialogue like the forensic debate. The classification of basic types of dialogue in table 2 below (Walton 1998) has emerged from the study of fallacies as representing conversational contexts of argument used in the most common kinds of cases where fallacies occur. The task of informal logic is to judge whether given examples of arguments in real cases are fallacious or not by some objective standard. Research on argumentation has shown that while reasoning and inference are important, account must be taken of how the given argument was used for some purpose in a dialogue structure representing its conversational setting (Reed and Norman 2003). The six types of dialogue represented in table 2 have proved to be especially important.

Table 2: Basic 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

Persuasion dialogue can be best identified by citing the well-known critical discussion type of dialogue analyzed by van Eemeren and Grootendorst (1984, 1987, 1992). The goal of the critical discussion is to resolve a conflict of opinions by rational argumentation. The conflict is identified at the confrontation stage, and then the dialogue proceeds through three other stages, the opening stage, the argumentation stage and the closing stage. There are ten rules for the critical discussion given in van Eemeren and Grootendorst (1987: 284-293), requiring the participants to defend their claims with rational argumentation. The critical discussion has been classified as a type of persuasion dialogue and formal models of different types of persuasion dialogue have been constructed in Walton and Krabbe (1995). On that analysis, a leading characteristic of persuasion dialogue is that retraction of commitments is reasonably, but not completely permissive. In contrast, the inquiry type of dialogue has the defining property of cumulativeness, requiring that when a participant commits to a statement, at least ideally, that commitment should never have to be retracted. Negotiation dialogue is quite different from either persuasion or inquiry, for the goal is to prove anything or show it to be true by rational argument. The goal is not to make a deal that both parties can live with. Deliberation is about what course of action to adopt in a situation requiring a choice. A useful formal model of deliberation dialogue that shows its moves and stages has been built by Hitchcock, McBurney and Parsons (2001). Carberry (1990) has presented an analysis of the structure of information-seeking dialogue in collecting data in computing. Walton and Krabbe (1995) have shown that there are also various mixed dialogues that combine features of the six basic types. The debate, for example, is classified partly as persuasion type of dialogue, but also as containing elements of the eristic dialogue, meaning that the aim is to win a victory even if it means using fallacious argumentation.

Now let's go back to the children's health example again. It started out, let's say, as an editorial on health issues in a popular magazine. The argument could thus be seen as part of a persuasion dialogue in which the author is advocating the controversial thesis that children in North America are unhealthy. The author cites various arguments to support her thesis, as shown in the full text diagram for the children's health argument above. Presumably, however, her argument is based on empirical claims, finding about children's health collected by researchers. As shown in the argument diagram, part of the argumentation is based on an explicit appeal to expert opinion. The remaining premises also presum-

ably have been collected as medical data of some sort, but sources for these items of information are not offered by the author. Of course, the argument is only part of an editorial in a magazine article. It is not necessary for the author to have to cite sources of all data, to cite exact statistical findings, and to document how the findings were collected and who stands behind them as medical experts. Still, as one tries to evaluate the argument, the context moves back from an initial persuasion dialogue to an information seeking type of dialogue in which the offering of medical evidence of some sort is presumed. In other words, there appears to be a shift from an initial persuasion type of dialogue to an anterior information-seeking type of dialogue in which expert scientific evidence is presumed to be available.

5. Commitment Operations in Dialogues

Much traditional thinking about argumentation in philosophy as well as AI has been based on a BDI (belief-desire-intention) model. But there have been many difficulties with the BDI model. Beliefs desires and intentions are psychological states, and in trying to analyze or evaluate argumentation, trying to pin down an arguer's actual mental states can be quite a hard task. On the other hand, it is often possible to cite textual evidence to indicate what statements an arguer has committed himself to. Commitment can be seen as public. In a dialogue, a participant becomes committed to a statement in virtue of having gone "on record" by asserting it, and if so a public record could be kept of his commitments in commitment store. Hamblin (1970) defined a commitment store as a set of statements attributed to a participant in a dialogue based on the moves he has made in the dialogue, as recorded. As the dialogue proceeds, statements can be added to this store or deleted from it, according to the commitment rules. For example, if an arguer asserts a statement, then that statement can be inserted into her commitment store by the commitment rule governing assertions An arguer can also retract commitment to a statement, deleting it from her commitment store. As noted above, rules for retraction can vary for different types of dialogue.

It should be clearly recognized that for Hamblin (1970: 257), commitment is not the same as belief. Commitment is a normative notion, meaning that the structure of the dialogue along with arguer's recorded moves determines the arguer's commitments. By making a certain type of move in dialogue, an agent is automatically "bound" or committed to

other statements implied by the move. On of the problems in current argumentation theory, as shown in the previous section, is to determine how argumentation schemes bind commitment. In deductive formal logic, the truth table for the material conditional defines the conditions under which a deductively valid argument, for example one which has the *modus ponens* form, is binding. If the respondent is committed to the premises then he must (by logical necessity) be committed to the conclusion. The conditions for the bindingness of a defeasible argument having the form of an argumentation scheme like appeal to expert opinion are comparable, but are also quite different. These conditions are shown in the Comm. Table below.

Table 3: The Comm. Table

Committed to premises	Committed to conclusion	Argument not necessary
Committed to premises	Uncommitted to conclusion	Must commit to conclusion or ask critical question
Uncommitted to premises	Committed to conclusion	Argument not necessary
Uncommitted to premises	Uncommitted to conclusion	Can question a premise

The comm. table shows the options in a dialogue when a proponent puts forward an argument fitting a defeasible argumentation scheme. First consider row one. Suppose the respondent is already committed to the conclusion. Then argumentation is not necessary, and there is no effect on the respondent's commitment store. Next consider rows three and four. Suppose the respondent uncommitted to the premises. Whether he is committed to the conclusion or not, the argument does not force him to alter his existing commitments. He has the option of replying by simply indicating he is not committed to one of the premises. It is only in the remaining row of the table, row two, that something significant has to happen to the respondent's commitments in the dialogue. Here, either the respondent must ask one of the appropriate critical questions matching the argumentation scheme, or he must change his commitment set by becoming committed to the conclusion. Thus we can see how argumentation schemes have a structure that makes a defeasible argument binding on a respondent's commitments in a dialogue.

All problems of commitment management for defeasible argumentation in dialogue have not been solved yet however. There is still another question. What happens in a dialogue when the respondent runs out of critical questions? For example with the appeal to expert opinion scheme, what happens when the respondent has asked all six critical questions? Does the respondent then finally have to commit to the conclusion unreservedly, or can he still go on asking other critical questions? This question expresses the completeness problem for dialogue argumentation. This problem remains unsolved so far. For as indicated in (Walton 1997), there can be subquestions for each critical question matching the appeal to expert opinion. The solution to the problem, it seems, resides in dialogue closure, achieved at the closing stage of a dialogue. Only then is the possibility of further critical questioning completely closed off. I leave this unsolved problem for future investigations.

6. How Argumentation Schemes are Binding in Dialogues

The argumentation scheme for appeal to expert opinion does not represent a form of argument that is deductively valid or inductively strong. So many might wonder how such an argument form is binding. If you accept the premises, do you do not necessarily have to accept the conclusion, or even accept it as probably true. You can raise critical questions. If so, many might say, the argument has does not appear to be binding on the recipient to whom it was directed. So what good is it then? Or what is its logic? After all, if a structurally correct argument does not bind the recipient to accepting the conclusion, once he accepts the premises, what kind of rationality does it have as an argument? To answer this question, the connection between the defeasible argumentation scheme and the structure of dialogue surrounding it must be clarified. To see how the argumentation works in such a case, let's turn again to the example of appeal to expert opinion. Suppose the proponent in a dialogue puts forward an appeal to expert opinion to the respondent. In such a case the respondent only has three options at his next move in the dialogue.
1. He can question one of the premises.
2. He can ask one of the six appropriate critical questions (shown above) matching the scheme.
3. He can accept the argument (at least tentatively, subject to further questioning).

To some, however, this list of options may seem too restrictive. Surely, some might say, the respondent should have the additional option of bringing forward another argument - a refutation designed to defeat the appeal to expert opinion just put forward. Should the respondent have that option or not? This question expresses the right to immediately rebut (RIB) problem. A respondent's freedom is determined by how strict (tight) or loose (free) the dialogue is. In a rigorous persuasion dialogue (RPD) how the respondent must reply to each previous move by the other party is determined by rules that are strict. Only a restricted range of replies is allowed. In a permissive persuasion dialogue (PPD), much more freedom is allowed. In PPD, an arguer is free to make several kinds of speech acts at a given move. He can put forward an argument and, in the same move, ask a question.

But in one key respect, even PPD is restrictive. The rules for PPD in (Walton and Krabbe 1995: 133-140) do not allow the respondent to bring forward a counter-argument at the next move. The reason is that in PPD, a participant is only allowed to bring forward an argument under carefully restricted conditions. Thus the question of how binding the argumentation scheme should be in a dialogue is posed, since alternatives to PPD can be considered. Should dialogue rules leave a respondent free to rebut an argument having the form of a defeasible argumentation scheme by immediately putting forward a counter-argument? There is what could be called the tighter versus the looser approach. Many might prefer the looser approach on the grounds that it offers more freedom for a respondent to express opposition an argument.

The contrast between RPD and PPD in (Walton and Krabbe 1995) represents two extreme poles, so to speak, in formal models of dialogue. RPD is nicely amenable to formalization, and it certainly allows the proponent of an argument to pin the respondent down to some fixed options so he can't waffle around by refusing to answer, go off on irrelevant tangents, and us other escape routes. But RPD is too rigid to represent empirical cases of real dialogue. PPD is much more flexible, and hence much more realistic as a way of representing cases of real dialogue. But this flexibility introduces a fundamental problem of pinning down commitment. The respondent has a lot of flexibility. So when the proponent presents a valid (or structurally correct) argument and the respondent doesn't want to accept its conclusion, he can just not accept the premises. Or if he was previously committed to the premises, he can just retract commitment to one or more of them now. Thus the proponent

has a problem. How can he "pin down" the respondent who always retracts commitments when it appears that he might be in danger of losing the argument? In (Walton and Krabbe 1995) this problem is dealt with by bringing in rules to various versions of PPD that inhibited retraction. For example on page 147 ff., rules are given that require stability in the retraction of commitments. These rules make retraction "sticky", meaning that the respondent cannot just retract any single commitment arbitrarily. If the commitment in question follows form other commitments, or is closely related to them, the respondent may have to retract these other commitments first.

However, the complexity of these se stability rules may suggest that a simpler system would show more clearly how argumentation schemes have an effect on commitment. There could be a simple rule such that if the respondent accepts the premises of the proponent's argument and the argument is structurally correct (by having the form of a known argumentation scheme), then the respondent should either have to accept the conclusion or he should have the burden of asking an appropriate critical question. Such a rule would gently force the respondent to take on commitments. Or at least it would prevent him from dodging around by refusing to answer, or going off on an irrelevant tangent. Such a rule is of course fairly restrictive, and I think that any system of dialogue of dialogue having it would not be as free as a PPD type of dialogue. But then it would not be as restrictive as an RPD dialogue either. It would be somewhere in between. It could be called a QPD type of dialogue. But there are doubts about how well QPD would work. One source of doubt stems from the defeasibility of argumentation schemes (or many of them, anyhow). In such cases, an argument should be subject to defeat if new information comes in, later in the dialogue, that defeats (refutes) the argument. But QPD does not seem to be open in this way. Of course, it should only be required that the respondent has to tentatively accept the conclusion. This seems to leave open the possibility that he could later retract it, maybe even after he has asked all the critical questions and the dialogue has run along a ways further. Maybe what could be done is to have another rule saying that the respondent can do this. But then some restrictions could be placed on this option.

New Evidence Rule: Once the respondent has accepted the premises and asked all the appropriate critical questions, he must then tentatively accept the conclusion, but 'tentatively' mean that he can later retract it,

provided new, relevant information that defeats the conclusion has come into the dialogue.

The new evidence rule would enable argumentation schemes to have some impact on commitment, but would at the same time be compatible with the defeasibility of the presumptive argumentation schemes. But when all is said and done, the new evidence rule seems too restrictive to allow the respondent to bring forward a counter-argument that might defeat the original argument. Does that matter?

In a persuasion dialogue, both sides typically put forward many defeasible arguments over the course of the dialogue. But a defeasible argument like an appeal to expert opinion normally gives only a small weight of evidence for or against the conclusion to be proved globally in the dialogue. According to one approach, only when you when you put a mass of such arguments of different kinds together at the end of the dialogue is a decisive tilting of the burden of proof achieved. The resolution of the issue in a dialogue does not generally work by pitting one single argument against another opposed argument. The outcome is decided at the end of the dialogue, when all relevant arguments of different kinds are weighed up together. When confronted by a single argument that meets the requirements of the argumentation scheme corresponding to it, the respondent should react right away to that argument. If he is committed to the premises, he should also become committed to the conclusion, unless he can ask the right critical questions. That, at any rate, is the philosophy behind the tighter approach to argumentation schemes.

This tighter approach characteristic of QPD could work as a formal model of certain kinds of dialogue. For example in an examination dialogue where a proponent's argument is being critically questioned to test is worthiness by asking questions that probe into its weak points, a critical question needs to be answered. If it is not answered, the original argument is defeated. Consider, for example, the examination of an expert witness in a trial. The witness has put forward an opinion on something, but when her argument put forward to support that is questioned in cross-examination, she refuses to answer the question. In such a case, her argument would certainly be defeated, or at any rate would seem not very convincing. But as a general model of dialogue of a more common and familiar kind, the QPD approach doesn't work. Consider an argument put forward by the prosecution in a trial and critically questioned by the defence. When it is the turn of the prosecution side to present argumen-

tation, this attorney doesn't necessarily have to reply to the question immediately by giving an appropriate answer that matches the scheme for the argument. Instead she might well present a counter-argument, or simply decide to leave the critical question unanswered, pursuing a different line of argumentation altogether. Thus to model the kind of argumentation typically found in a trial, the QPD type of dialogue is not a good fit.

What these considerations reveal is that argumentation, of the kind found in everyday conversations, or in a trial in law, have a dialectical structure than is more complex than initial appearances may suggest. In a trial, for example, examining a witness represents a different type of dialogue than the kind of argumentation used by a lawyer to attack the argumentation of the other side, or to sum up her case at the end of the trial. Another example would be a parliamentary debate on whether to fund the construction of a new dam project. This type of dialogue would fit the deliberation model. The participants have to weight the costs and other factors and then arrive at a decision on whether to vote for or against going ahead with the project. But during the debate experts might be brought in to give testimony. Engineers might offer testimony, and might answer questions and relate a lot of relevant factual information concerning dams. This process of questioning and answering represents a kind of information-seeking dialogue. Intelligent deliberation must be based on a lot of information concerning the facts of a case. Hence it is quite normal for deliberation dialogue and information-seeking dialogue to be joined to each other, and for the one dialogue to depend on the other.

7. Dialectical Shifts

There can be dialectical shifts from one type of dialogue to another during a sequence of argumentation. Such dialectical shifts can easily be shown to be vitally important for analyzing and evaluating real argumentation in a conversational setting. In this section it is shown how, in some cases, the shift is based on embedding of the one dialogue into another. To say that one dialogue is embedded in another means that the two are structurally connected so that the argumentation in one supports the argumentation in the other. In an embedding, the embedded dialogue helps to bring the argumentation in the other dialogue towards its goal. For example, in a court of law, a prosecuting attorney trying to persuade a jury that a defendant has committed a crime may cite ballistic or DNA evidence using expert scientific testimony. In such a case, the shift can be

an embedding, and the argument based on it can be quite appropriate and relevant as evidence in the trial. Some shifts are, however, negative or "illicit". For example when a persuasion dialogue shifts to an eristic (quarrelsome) dialogue in an ad hominem (personal) attack, that shift can represent a deterioration of the persuasion dialogue. These basic notions of dialogue theory, illustrated by cases, are applied to the problem of how argumentation is rationally binding.

There can be transitions during the same sequence of argumentation from one type of dialogue to another. Such dialectical shifts are very common in natural language argumentation. One example that has been much studied is the picture hanging case. It has been cited, for example, by Parsons and Jennings (1996).

The Picture Hanging Case

Two agents have a joint intention to hang a picture. They discuss how to do it. The first agent has the picture and a hammer, and knows where the second agent can get a nail. The first agent proposes hanging the picture provided the other agent will supply the nail.

In the picture hanging case, there is a shift from a deliberation dialogue to a negotiation dialogue.

The PC Case

Bill and Edith have computer problems in the project they are working on, and decide that the solution is to buy a new PC. They don't know much about the latest features of new computers, so they ask their young colleague, Brent, who recently bought a new PC.

In the PC case, there is a shift from a deliberation dialogue to an information-seeking dialogue.

The Airline Case[2]

A major airline hired a new CEO who cut costs, angering the union, who began to portray him as a devil. Union-management negotiations broke down, and the company went bankrupt.

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[2] This case is a brief outline of an actual example presented in my book (1992).

In the airline case, there was a shift from negotiation dialogue to eristic dialogue.

Reed (1998: 249) has produced a computing method that can be used to model dialectical shifts formally by marking the type of dialogue in a sequence of argumentation. The markers indicate the points where the shift begins and ends.

A kind of shift that is very common in computing occurs in expert systems where the user needs to ask the expert to explain something (Cawsey, 1992). There is a shift from an expert opinion dialogue, which is a special type of information-seeking dialogue, to an interval in which another type of dialogue occurs where the user needs to examine and clarify what the expert meant. Cases of this sort studied by Grasso, Cawsey and Jones (2000) show how the solving of problems and apparent conflicts in expert advice-giving dialogue can involve a shift to a persuasion dialogue interval.

In the picture hanging case and the PC case, the dialectical shift from one type of dialogue to another was a good thing in that it helped the argumentation to move along constructively. The move to the second dialogue assisted the proper progress of the first towards it goal. In such cases, the shift is said to be an embedding of one dialogue into the other. But not all shifts are embeddings. The shift in the airline case was a bad thing. The dialogue deteriorated. The negotiation dialogue was blocked. Thus the general problem is posed of how to tell in a given case whether a shift is an embedding or a bad kind of shift. In Walton and Krabbe (1995) the problem was expressed as one of judging whether a shift is "licit" or "illicit". Dialectical shifts are known to be associated with fallacies, and they can be deceptive and tricky.

Another type of shift is to a meta-dialogue in which issues of burden of proof are resolved, either by a third party or by a discussion between the two primary parties. For example, it often happens that in a dialogue one party says 'You prove it' and the other replies by saying 'You disprove it'. This kind of stalemate can only be resolved by deciding which side has the burden of proof. The burden of proof meta-dialogue needs to be embedded in the main dialogue.

8. Conclusions

Having introduced the main concepts and tools of argumentation theory, let us now return to the problem posed by a typical case like the fat

children argument. This argument looks fairly persuasive, if one were to encounter it in an editorial. Of course one could question the premises. Are children really less and less physically active? Do they spend too much time on the computer and watching television? To prove or disprove these premises one might collect data or appeal to the expert opinions of the experts who study such things. Such a move represents a shift to an information-seeking kind of dialogue in which a search for facts is undertaken. But there is one appeal to expert opinion explicitly made in the argument. The opinion of Dr. Blast is cited supporting the claim that children eat too much junk food. Blast, it is assumed, is an expert. It is said that he is director of the Child Health Research Institute. Certainly the argument depends on the premise that Blast is an expert in the relevant domain. This missing premise has been made explicit in the full text argument diagram for the fat children argument displayed above. If a critic questions whether Blast is credible as an expert source, or whether his field is in the right domain of knowledge, the argument from expert opinion is defeated. For the argument to be persuasive, Blast's credentials must be given, or the argument ceases to be persuasive. If we don't really know who Blast is, or whether he is really a medical doctor, or at least has a Ph.D. in some field in which children's health falls, the argument falls down. Thus with some critical questions, merely asking the question makes the argument fall down. It is not restored until the question has been answered by giving the right type of reply.

Some of the other critical questions are on a different footing however. If Blast is cited as an expert, because he is a medical doctor for example, it is assumed that he is personally reliable as a source. If a questioner wants to attack Blast's credibility, say by alleging that he has lied in the past, or that he has been paid by a drug company to say what he said, that attack is not very convincing unless backed up with some supporting evidence. Merely saying 'Blast is not personally reliable as a source' does not do much to upset the argument from expert opinion. The arguer can simply reply 'Why not?', and unless the question is answered, the original critical question does not seem to shift a serious burden of proof against the side who used the argument from expert opinion. It is assumed that Blast is credible, if indeed he an expert. Any claim to the contrary must have at least some evidence behind it, to be convincing enough to justify withdrawal of the original argument.

Thus here is the problem in a nutshell. Some critical questions defeat an argument based on an argumentation scheme, just by asking them,

while other require further support. Since there seems to be no universal formula for deciding which category each critical question should be in, the ultimate solution may be to invoke, in some cases, a meta-dialogue in which the issue of burden of proof is discussed and resolved. Once this problem has been solved, we will be able to evaluate arguments found in everyday conversational settings, as well as being able to identify and analyze them. But as shown above, there can be different degrees of strictness of rules appropriate for different argument settings. The completeness problem is easier to solve for QPD dialogues where any critical question asked must be answered, or the original argument is defeated. In many instances of everyday conversational and legal argumentation, the QPD model is too strict and the PPD model is the better one.

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