DOUGLAS WALTON

THE PLACE OF DIALOGUE THEORY IN LOGIC, COMPUTER SCIENCE AND COMMUNICATION STUDIES

ABSTRACT. Dialogue theory, although it has ancient roots, was put forward in the 1970s in logic as a structure that can be useful for helping to evaluate argumentation and informal fallacies. Recently, however, it has been taken up as a broader subject of investigation in computer science. This paper surveys both the historical and philosophical background of dialogue theory and the latest research initiatives on dialogue theory in computer science. The main components of dialogue theory are briefly explained. Included is a classification of the main types of dialogue that, it is argued, should provide the central focus for studying many important dialogue contexts in specific cases. Following these three surveys, a concluding prediction is made about the direction dialogue theory is likely to take in the next century, especially in relation to the growing field of communication studies.

Dialogue theory has recently come to be seen as the underlying structure on which to base the analysis and evaluation of argumentation and fallacies. As such, it is now seen as a vitally important part of theory by those of us working in argumentation studies. Although it is a very old subject, and leading ancient thinkers made important contributions to it, for two millenia it has lain dormant. Only in the 1970's, notably in the work of Hamblin, Barth and Krabbe, Rescher, Hintikka, and Grice, did the subject re-appear in analytical philosophy, although it had been studied earlier by the Erlangen School. But now in the 1990's some scientists, mainly computer scientists, are also getting seriously interested in dialogue theory, and even seeing it as a necessary part of their research initiatives in fields like expert systems technology and multi-agent systems. There is also growing interest in dialogue theory in communication studies. Judging from all these developments, dialogue theory is finally once again being regarded at the century's turn as a subject that is of some importance.

This paper outlines the philosophical background of dialogue theory and briefly surveys some of the latest research initiatives on dialogue theory in computer science. The main components of dialogue theory are briefly explained. Included is a classification of the main types of dialogue that, it is argued, should be the central subject matter of the field. The central problem of dialogue theory, retraction of commitments, along

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with one proposed solution, is briefly explained. Following these surveys, a prediction is made about the direction dialogue theory will take in the next century in relation to the growing field of communication studies.

The presentation has four parts. The first part briefly sketches out the philosophical and historical development of dialogue theory. The second part gives a quick overview of new scientific research initiatives on dialogue theory, mainly in computer science. The third part explains, in as simple a fashion as possible, the basic ideas or "building blocks" of dialogue theory. The fourth part looks toward the future, predicting that dialogue theory will be expanded in its grasp, to cover not only argumentation theory, but communication theory generally.

1. PHILOSOPHICAL BACKGROUND OF DIALOGUE THEORY

Dialogue theory was introduced to modern philosophy by Grice, in his ground-breaking paper on the logic of conversation (1975). In the Gricean framework, an argument is viewed as a contribution to a collaborative conversation between two speech partners. From the Gricean point of view, an argument, or any other move (speech act), should be evaluated on the basis of its collaborative value as a contribution to the conversation, at the stage of the conversation where it was put forward. According to Grice, there are so-called conversational maxims that represent guiding rules of polite discourse. These maxims are the basis of implicatures, or inferences suggested to one party by what another party says in the context of a conversation. Although dialogue theory was long dormant in philosophy before Grice, it is not altogether new.

Portraying arguments in a dialogue framework, in which two parties engage in an exchange of orderly questions and replies, is quite an old idea in philosophy. It was highly familiar to the Greek philosophers, and is best known through the dialogues written by Plato to represent the philosophical activities of Socrates (Robinson 1953). Dialectic was very important to the Greek philosophers, and Aristotle even cited five kinds of arguments used in discussion: didactic, dialectical, examination and contentious (eristic) arguments (*On Sophistical Refutations* 165a38–165b12). But after the Greeks, and especially after the rise of deductive (non-dialectical) logic, the conversational model of argumentation faded into the background. The Erlangen School in Germany, under Lorenzen, tried to revive formal dialectic as a subject, and constructed formal systems of logical reasoning in which a proponent reasons with an opponent. But the attempted revival did not succeed in catching on. In an independent line of development, Charles Hamblin (1970; 1971) the Australian logician, con-

structed mathematical models of dialogue that he called formal dialectical systems. Barth and Krabbe (1982) built up new systems. Other systems have been constructed by Hintikka (1979, 1992, 1993), Mackenzie (1981, 1990) and Rescher (1977). These systems, and others mentioned below, were meant to provide formal structures to represent how a sequence of rational argumentation should proceed when one party argues with another in an orderly way. The ultimate purpose of constructing these systems was to provide structural models that could be applied to the kinds of argumentation associated with the traditional informal fallacies, long dealt with in an informal way throughout the history of logic. These historical roots of the field of formal dialectic are chronicled in (Walton and Krabbe 1995), where the field is also developed through the addition of new formal techniques and new formal dialectical systems.

The advent of recent developments in argumentation theory (van Eemeren Grootendorst 1984, 1987, 1992). and informal logic (Johnson and Blair 1985) has given rise to a different way of looking at arguments. For the first time, there has been a systematic attempt to analyze and evaluate everyday arguments, as actually used in real cases in daily conversational exchanges. Instead of the one-liner examples of the fallacies being dismissively evaluated without any real attempt to take context into account, serious attempts are being made to grapple with the problems posed by common forms of argument that are fallacious in some cases but reasonable in others. This practical and more realistic approach to the analysis and evaluation of everyday arguments has inevitably broadened the whole notion of rationality. Instead of being seen as a designated set of propositions, an argument is now being seen as a move made in a dialogue in which two parties are attempting to reason together.

To support this new approach a dialogue theory is in the process of being developed. But how broad or narrow should dialogue theory be? How tightly should the notion of a dialogue be formalized? What sorts of actual dialogues are meant to be modeled by the theory? Is the theory restricted to dialogues in which two parties are trying to resolve a conflict of opinions by rational argumentation? Or should negotiations, and other types of argumentative exchanges also be covered under the subject of dialogue theory? If the scope of dialogue theory is wide enough to cover all kinds of communicative exchanges in which two parties are trying to reason with each other, what domains other than critical thinking should it apply to?

The intended use of dialogue theory was to provide a normative structure on which to ground methods for improving critical thinking skills, including writing skills and academic research skills, primarily in a uni-

versity setting. But dialogue theory has all sorts of other potential uses. It is now seen as having many important applications in computer science, and this perception has stimulated its growth.

2. NEW SCIENTIFIC RESEARCH ON DIALOGUE THEORY

Argumentation and dialogue theory have been of interest in expert systems research, especially in so-called "expert critiquing systems" (Silverman 1992). Critiquing involves "a two-way communication" in which human practitioners and experts can collaborate on problem solving tasks (Silverman 1992, 4). One interesting area of study here is that of cognitive biases, accidents, slips and lapses of various kinds (p. 16). This area of critiquing systems has much in common with the study of informal fallacies. But expert systems research is only one area of computer science that is based on dialogue theory. Many other fields of research in computer science are coming to realize the importance of dialogue theory as well. For example, the AAAI Fall 1997 Symposium on Communicative Action in Humans and Machines, held in Cambridge, Mass., re-examined the view of communication as the use of speech acts in dialogues, as contrasted with the view of communication as transmission of information (according to their website).
http://www.cs.umd.edu/users/traum/CA/summary.html
The symposium considered dialogue phenomena extending classical speech act theory, including turn-taking, problem-solving, feedback, persuasion, and the roles of participants in dialogues. The growing field of expert systems provides a natural application for dialogue theory. When a user of advice or information consults an expert source (whether that source is a human or a machine), more is required than the straightforward asking of factual questions. Explanations and clarifications are often helpful, because the expert may often make statements that the user has all kinds of problems understanding, or being able to implement. Thus sequences of questions and replies – dialogue in short – is a vitally important aspect of the implementation of any expert system.

Much research in computer science, not only in robotics but in many other areas as well, increasingly uses what is called "agent reasoning" of a kind that is basically the same as what is called practical reasoning, or the Aristotelian practical syllogism, in philosophy. It is goal-directed reasoning by an agent that concludes to a prudent line of action, based on its goals and what it knows about its external situation. An agent is an entity that carries out actions, based on its goals, and that can be aware of information about its external situation as well, including being able to see

some of the consequences of its actions. According to Russell and Norvig (1995, 652) agents communicate in dialogues by asking each other questions, answering these questions, informing each other about states of the world, making requests or commands to perform actions, making promises, and sharing feelings with each other. Each agent can assume that any other agent it communicates with has goals, and that any such agent will base its actions on these goals. In other words, an agent can assume that another agent will act according to practical reasoning, or what might be called practical rationality. This agent model of practical reasoning is now very well established in computer science. The main concern at present is to extend it to cases of multi-agent reasoning where teams of agents act together collaboratively. The central problem here is how the agents communicate with each other for the purpose of acing collaboratively.

On May 1, 1999, there was a workshop on agent communication language held in Seattle, preceding the Autonomous Agents '99 Meeting. The subject of the workshop was "specifying and implementing conversation policies". According to the description of the program posted on its website,

(http://www.dfki.de/media/workshops/agents99/greaves.txt)

the expansion of agent research is broadening to include the study of goal-directed conversations which fall into several recurrent patterns or types. Conversation policies, to be defined by the conference, are said to be the means of encoding these different conversation types. One of the most important types of dialogue that has been studied so far in multi-agent systems is that of negotiation. Negotiation is rightly seen as important, because agents may even have to negotiate on what type of dialogue to engage in. There is a project called "Negotiation by Dialectic Argumentation" being carried out by the Queen Mary and Westfield College Electronic Engineering Department of the University of London.

http://www.elec.qmw.ac.uk/dai/projects/negot_via_arg.html

This project, built around the notion of an autonomous agent, concerns cases where agents need to come to agreement on a course of action. The predominant mechanism cited as important by the project is that of negotiation.

The Swedish project *s-dime* includes among its objectives the construction of a computational model of dialogue moves suitable for modeling a corpus of natural language dialogues (in Swedish).

http://www.ling.gu.se/research/projects/sdime/sdime_links.html

There is also a project at Odense University in Denmark which does fundamental research on dialogue systems.

http://www.mip.ou.dk/nis/research/index.html

This research is said to include the theory of cooperative human-machine dialogue and models for interactive speech systems. Both these projects are oriented to pragmatics and linguistics. There is much current interest in linguistics on extending speech act theory to uses of speech acts in wider contexts of communication.

Several Dutch researchers are active in various aspects of dialogue modeling in computing. Gerard Vreeswijk has designed an interactive argumentation system called IACAS. It allows a human user to start a dispute, and then engage in interactive argumentation with a computer. You can find it at this web site.
http://tcw2.ppsw.rug.nl/ gerard/iacas.html
It uses a language in which propositions, rules and cases are represented. Vreeswijk (1997) has surveyed a number of formal systems of argumentation. Almost all of these systems include detailed treatment of something that is regarded as highly important in computer modeling of argumentation – the concept of the defeasible inference – a type of inference that is only provisionally acceptable, and that is subject to default as new information comes in to be considered. The counter-examples that defeat a given defeasible inference cannot always be anticipated in advance. Hence defeasible reasoning has been difficult to model using the resources of standard logics, and this problem has led to the possibility of using formal dialogue structures to model defeasible argumentation.

Henry Prakken of the Faculty of Law of the Free University of Amsterdam has worked on the topic of how logical research on defeasible argumentation can be relevant to research on negotiation dialogues. There is quite a body of researchers in the Netherlands interested in dialogue theory as applied both to computer science and law. A good idea of this work can be gotten by looking at the journal, *Artificial Intelligence and Law*. The Ph.D. thesis of Arno Lodder (1998) is a good source to get an idea of how dialogue structure is being applied to legal argumentation, another topic of recent interest in computer science. Lodder argues for using a dialogical model of legal justification, using structures of dialogue adapted from Hamblin, Rescher and Mackenzie. He applies these models to actual legal cases, showing how the argumentation in each case can be modeled as a dialogue with participants, commitments, moves and rules of the kind explained in section three below.

There is a Computational Dialectics or DFG (Forschergruppe Kommunikatives Verstehen) research group in Germany whose stated goal is to “combine results from AI, in particular nonmonotonic reasoning, and philosophical argumentation theory in order to formalize decision making processes based on dialogues”.

http://pikas.inf.tu-dresden.de/aktivitaeten/ki97-98/FF/cd.html
Their focus is said to be on "models of argumentation contexts which regulate the role of dialogue partners, their rights and obligations, burdens of proof etc." Listed as the contact person is Dr. Gerhard Brewka of the Intelligent Systems Department of the University of Leipzig. Within this group a computational dialectics project called Zeno, with Tom Gordon as the leader, has the goal of devising a programming language "for expressing the discourse norms which regulate and coordinate the procedures for making group decisions, acquiring common knowledge, and resolving disputes".
http://www-fit-ki.gmd.de/projects/zeno.old.html
The web page for Project Zeno calls Computational Dialectics a new subfield of Artificial Intelligence.

Another recent development is the Computer-Supported Collaborative Argumentation Resource Site, including the CSCA Discussion List. You can get information about the list from the following site.
http://kmi.open.ac.uk/ simonb/csca/index.html
This site is concerned with research into tools and techniques used to support argumentation in what are called "issue-based information systems" like debate and negotiation.

3. FUNDAMENTAL CONCEPTS OF DIALOGUE THEORY

The simplest illustration of a dialogue is a case where one party asks another party a question. Even if the second party fails to offer any response, the context may indicate that some relevant reply is called for. Hence here we have a dialogue. Not only that, the very asking of the question, in the right context, has normative implications. Certain responses do not count as an answer. Certain responses do not even qualify as a relevant reply. Thus even an apparently unstructured case of dialogue in which someone asks a question in a casual conversation may impose enough normative requirements that it is useful to see it as a dialogue in the sense important for dialogue theory. So a dialogue is a verbal exchange between two parties, according to some kind of rules, conventions or expectations. But how precise and explicit do the rules need to be?

To answer this question without confusing ambiguity, a distinction needs to be made between the descriptive study of dialogue and the formal study of dialogue (Hamblin 1970, 256). The descriptive study of dialogue is concerned with actual conversational exchanges like parliamentary debates, legal cross-examinations, and so forth. The formal study of dialogue "consists in the setting up of simple systems of precise but not necessarily

realistic rules, and the plotting out of the properties of the dialogues that might be played out in accordance with them" (p. 256). A dialogue in the formal sense is an exchange with a certain kind of structure – that of the so-called formal model of dialogue. In actual dialogues it is not always clear what the rules are. In a formal dialogue, certain kinds of rules are laid down precisely. The value of the formal dialogue is that it can be applied to an actual dialogue in a given case, and used as a tool to help analyze the case.

Following the general outline of Hamblin (1970, 1971) and Walton and Krabbe (1995), four fundamental building blocks of any formal dialectical system can be identified: (1) the two participants, called the proponent and the respondent, (2) the types of moves (taking the form of various speech acts) that the two participants are allowed to make, as each takes his or her turn to speak, (3) the sequence of moves, in which the appropriateness of each move depends on the type of preceding move made by the other party, (4) the goal of the dialogue as a whole. The sequence of moves should ideally move towards the fulfillment of the goal as the dialogue proceeds. In any case of actual dialogue, one can evaluate arguments and other moves made in the dialogue, according to whether or not they are productive in collaborating, at the stage they were made, in moving the dialogue towards its ultimate goal. Various formal tools used in dialogue theory have proved to be useful for this purpose.

The tableau method of modeling the ordered sequence of moves in a dialogue in two columns has been used by Rescher (1977), Hintikka (1979, 1992, 1993, 1995), by Hintikka and Hintikka (1982), by Barth and Krabbe (1982) and by Carlson (1983). A simple illustration of how the method works is given in Figure 1. The letters *A*, *B*, *C*, . . . , stand for propositions. In this illustration, the notation used is similar to that of Hamblin (1971). Why-questions are allowed, as well as various other sorts of moves that indicate whether a participant accepts a particular proposition or not.

Proponent	**Respondent**
1. Why should I accept *A*?	Because *B*, and if *B* then *A*.
2. Why should I accept *B*?	Because you accepted it before.
3. All right, I accept *B*.	Do you accept 'If *B* then *A*'?
4. Yes.	Do you accept *A*?
5. No.	You are inconsistent!

Figure 1.

In the sample dialogue illustrated in Figure 1, the proponent starts the sequence by asking the respondent why he she should accept proposition

A. The respondent replies with a deductively valid argument that has *A* as its conclusion. What is illustrated here are two kinds of moves explained below. One is the why-question, which asks for a justification in the form of an argument. The other is the putting forward of an argument, a kind of move in which one proposition (or a set of them) is cited as a basis for support of a particular proposition. The dialogue proceeds as the proponent continues the sequence of argumentation with the respondent. At the last move in the sequence, the respondent shows how the proponent has committed herself to an inconsistency. The illustration in Figure 1 shows how the tableau method can be used to represent the sequence of argumentation in a dialogue exchange. Each number at the left represents a *round*, or pair of moves by one party and then the other The dialogue begins with the opening move, and then each pair of move-numbers represents a so-called "round" or adjacency pair (Hamblin 1970, 1971; Mackenzie 1981, 1990).

Four kinds of moves are especially important in dialectical systems: (1) the asking of questions, (2) the making of assertions, (3) the retracting of assertions, and (4) the putting forward of arguments. An assertion contains a proposition, and a form of speech indicating the assertor is committing herself to that proposition in a strong way, implying she is willing to defend it if challenged to do so. Two fundamental types of questions are yes-no questions and why-questions (Kestler 1982; Walton 1989). A *yes-no question* admits of only two direct answers – the affirmative answer (yes), and the negative answer (no). A yes-no question is designed to rule out the option "I don't know." as an answer or acceptable reply. The yes-no question is typical of what is called a *choice question*, which limits the options in any allowable direct answer to a definite set of choices. The *search question* does not restrict the respondent to some definite set of choices direct answers. A narrative answer that tells a story could even be a direct answer appropriate for a search question. The questioner who asks a choice question is more controlling than the questioner who asks a search question, leaving the respondent less freedom to offer any information he thinks may be relevant.

The formal dialectical structures presented above are meant to model argumentation. But it is quite possible that such structures could be expanded to model other kinds of speech acts as well. For example, formal dialectical structures could be used to model different kinds of explanations. Such an expansion of the scope of formal dialectic would be a highly attractive prospect from the point of view of communication theory. Primarily however, so far dialogue theory has been concerned with arguments, and with the task of evaluating arguments as strong or weak, correct or incorrect, reasonable or fallacious. For this purpose, its primary

TABLE I

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

use has been to evaluate a given argument from a normative point of view, which could also be called a point of view of critical thinking. The aim is to spot the weak points in argument where the argument could be criticized as falling short of the standards needed to make it strong, so that acceptance of the premises provides good reasons for rational acceptance of the conclusion.

The Gricean framework of conversation posed a problem that Grice did not solve. The problem is that there can be different types of conversational exchanges. But how can we classify these different types of exchanges in terms of their goals and rules? A solution to this problem has now been presented in *The New Dialectic* (1998). The new dialectic classifies many different types of dialogue that represent different kinds of goal-directed conversations in which argumentation is used to contribute to the goal of the dialogue. Six basic types of dialogue are described in the new dialectic – persuasion dialogue, the inquiry, negotiation dialogue, information-seeking dialogue, deliberation, and eristic dialogue. The properties of these six types of dialogue are summarized in Table 1.

In the new dialectic, each type of dialogue is used as a normative model that provides the standards for judging how a given argument should be correctly used in a given case. The assumption is that the text of discourse in the given case will provide enough evidence to warrant viewing the argument as supposedly being meant to be a contribution to that type of dialogue. In a persuasion dialogue for example, the one party, called the proponent has a particular thesis to be proved, while the other party, called the respondent, has the role of casting doubt on that thesis. The goal of

the proponent is to prove the proposition that is designated in advance as her ultimate thesis. The goal of the respondent is to resist this process. The basic feature of argumentation in all the types of dialogue is that the one party takes the commitments of the other as premises, and then by a series of steps of inference, uses these premises in arguments that aim towards proving an ultimate conclusion to the other party.

The more standard account of reasoning in philosophy and the social sciences today is the knowledge, belief and intention model. But the dialogue structure outlined above is based on a participant's commitments, as opposed to his actual beliefs. Another word for commitment is acceptance. 'Commitment' refers to what an arguer has gone on record as accepting, as far as one can tell, from what she has said (and/or done) in a given case, according to the evidence provided by the text and context of discourse in the case. The reason for preferring commitment over belief is that the current work in argumentation takes as its primary goal the evaluation of a given argument, based on the given text of discourse in which the argument was put forward. For this purpose, the arguer's actual beliefs may be extremely difficult to determine, and judging them is a psychological task. On the other hand, his commitments can be more easily determined judging from what he has said (using the given text of discourse). So the model of dialogue outlined here, and preferred in argumentation theory, is commitment-based. In the future however, this model can be extended to model belief, knowledge, and intentions.

According to the theory of Walton and Krabbe (1995) there can be dialectical shifts, or changes of context from one type of dialogue to another during the same continuous sequence of argumentation. For example, a contractor and a homeowner may be engaged in negotiation dialogue on a contract to install a concrete basement in a house. But then the argumentation may shift to a deliberation on whether installing a new concrete basement is a good idea, or whether some other alternative would be better. Or at another point, the discussion may shift to an information-seeking dialogue, in which the contractor informs the homeowner about the city regulations on thickness of concrete for house basements. Functional embeddings of dialogues of this sort have been discussed as a problem for computer modeling by Reed (1998). Reed (p. 250) uses an example of two agents deliberating on how to do a job, and then they begin negotiations when one proposes hiring the other to do the job. In practice, there can be many different kinds of dialectical shifts of this kind. In some cases, the new dialogue contributes to the success of the previous one. In other cases, the one dialogue is simply an interruption in the progress of the first one. But then the first dialogue can be easily resumed. But in some cases,

the advent of the second dialogue blocks the progress of the first one, and presents a serious obstacle to its progress. The problem of how to formally represent such functional embeddings of dialogues has not yet been solved. It is by no means a purely philosophical problem, and also represents a real problem for the development of computer dialogue systems, for example, in multi-agent dialogue systems.

4. THE PROBLEM OF RETRACTION

In designing any formal model of dialogue, the question of how much latitude a participant should have in retracting his prior commitments is a central decision. In some cases, an easy retraction should not be allowed. For example, if Bob has promised to help Wilma move the furniture out of her apartment, but then phones her the night before the move to retract his commitment, he needs to have a pretty good reason for the retraction. Or if a scientist announces a new discovery, but then retracts it, such a move is not really regarded as acceptable. In other cases, retraction clearly needs to be allowed. For example, if Wilma shows that Ed has now asserted a proposition that contradicts an earlier assertion he made. The form of this kind of dialogue is illustrated in Figure 1 above. In such a case, Ed needs to retract the one proposition or the other, and should freely be allowed to do so. He should even be encouraged to do so. Or if Ed shows that Wilma is committed to a thesis that cannot be defended by rational argumentation, then Wilma should retract her commitment to that proposition, or at least be allowed to do so without penalty. Given both kinds of cases, the problem is to set reasonable restrictions on retraction. Retraction should not be allowed too lightly, but on the other hand it should not be fixed in place too rigidly.

Ruling on retraction of commitment is something that should vary with the type of dialogue. For example, in deliberation, a fair degree of latitude in retracting commitment is necessary. The reason is that it is desirable for an agent to have a fair amount of prudential flexibility in deliberation. The reason is that reasoning in deliberation is defeasible as new information comes in. The circumstances of the agent in a deliberation tend to be constantly changing, and the agent must be alert to these changing circumstances and react accordingly. On the other hand, in the inquiry, the ideal is to have cumulative argumentation. Once a conclusion is verified as part of the inquiry, it is supposed to be proved to be true, so that there will be no need to go back and retract it, as the inquiry proceeds. The aim of the inquiry is to avoid retraction of previous commitments, insofar as it is possible.

Now let's consider the persuasion type of dialogue. In this type of dialogue, retraction should be allowed fairly freely, but not in all instances. Indeed, the main problem with the systems devised in Hamblin (1970, 1971) is that there are no restrictions on retraction. A participant can reply using the "no commitment" move whenever he or she wants to. The problem is that it is impossible to pin down commitment when engaging in a critical discussion. As soon as you appear to be getting close to disproving the opponent's thesis, or any proposition near to that thesis which could pose a threat to it, he can simply reply, "No commitment". This freedom is a serious problem in a persuasion dialogue, because you can never use any premises as "fixed points" to prove your thesis, or to disprove your opponent's thesis. As soon as you try to deploy your argument, the other party will simply retract commitment to the premises. How then can the problem of retraction be solved for persuasion dialogue?

There can be many ways of trying to solve this problem. There could be penalties for retraction, for example, that give some advantage to the other party, making his task of persuasion more difficult or lengthy. The solution advocated in (Walton and Krabbe 1995, 144–149) is to require *stability* in the retraction of commitments, meaning that a commitment cannot be retracted in isolation from related commitments in an argument. How this solution works in practice can be illustrated by a cases of what are called stability adjustments. An *internal stability adjustment* requires that once certain supporting premises for a commitment are removed, the commitment itself may have to be removed, unless other supports can be found. For example, consider the following dialogue.

Bob: The track is not open on Friday.

Edna: How do you know?

Bob: The notice on the board says so.

Edna: I saw the gym monitor remove that notice.

It is appropriate at this point in the dialogue for Bob to retract his commitment to his earlier claim that the gym is not open on Friday. The reason is that his reason for that commitment is undercut or at least challenged by Edna's remark. Since the monitor presumably knows when the gym is open or not, his action of removing the sign is quite good evidence on whether the gym is open or not. In this case then, an internal stability adjustment requires that Bob should retract his commitment. On the other hand, suppose the dialogue were to continue as follows.

Bob: Yes, but I saw him put it back up again.

In this case, Bob has given a good reason why he should not have to retract his commitment. So we see the general problem quite clearly here. Commitments are not always subject to retraction, but they are also not always non-retractable (fixed). The best rule for retraction lies somewhere in between.

An *external stability adjustment* (Walton and Krabbe 1995, 147), requires that once a particular proposition is retracted, some premises or warrants leading into that commitment will also have to be retracted. How such an external stability works can be illustrated by the following simple case.

Consider the following sequence of dialogue which occurs within a critical discussion on the issue of tipping. Bruce argues for the thesis that tipping is generally a good thing. Wilma thinks that tipping is a bad thing. As the argument proceeds, it becomes clear that she even thinks that tipping is a social practice that ought to be abolished. Bruce questions this point.

Bruce: Why should tipping be abolished?

Wilma: If something leads to bad consequences, it should be abolished. Tipping leads to bad consequences.

Bruce: Well that is a valid argument. But why does tipping lead to bad consequences?

Wilma: Tipping leads to many misunderstandings. Anything that leads to misunderstandings leads to bad consequences. Therefore tipping leads to bad consequences.

Bruce: Well, OK. Once again, your argument appears to be valid.

But then, let's suppose, the dialogue goes on for quite an interval, and Bruce produces many convincing arguments to the effect that abolishing tipping is not really feasible. Wilma then gives in. Instead of trying to argue that tipping should be abolished, she takes the line that it ought to be regulated and standardized. Although she thinks that tipping is bad thing, in general, she concedes that we can never entirely get rid of it, human nature being what it is. So she takes the line that it ought to be reconfigured in a form that eliminates or minimizes the bad consequences.

Now the problem in this case is – what should be done about Wilma's commitments, as expressed in the dialogue sequence above? Should she just be allowed to make the retraction, and should that be the end of it? Or should there be some penalty attached? The method of external stability adjustment would require a kind of penalty, in the sense that Wilma would not only have to retract this single proposition from her commitment set.

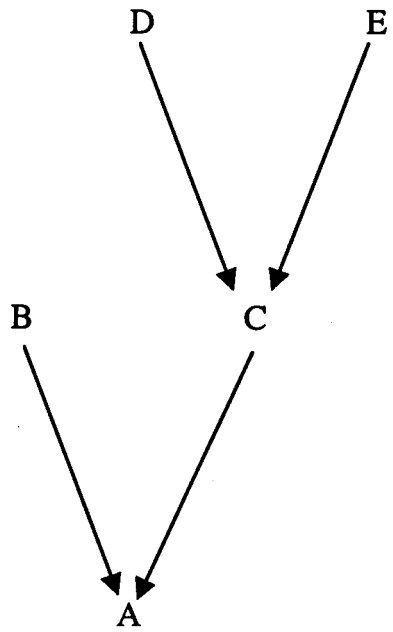

Figure 2.

She would also have to retract certain other propositions closely related to it. To see how the method works, it is best to construct an argument diagram.

Wilma used a chaining of two deductively valid arguments, as represented in the argument diagram below (Figure 2). The five propositions in the argumentation are labeled as follows.

A = Tipping should be abolished.

B = If something has bad consequences, it should be abolished.

C = Tipping has bad consequences.

D = Anything that leads to misunderstandings leads to bad consequences.

E = Tipping leads to misunderstandings.

Now that Wilma has retracted commitment to *A*, what should be done about her commitment to the other propositions represented in the diagram? *B* and *C* together, as premises, deductively imply *A*. If *A* is false, then one or the other of *B* or *C* must not be true. It appears then that Wilma should be given a choice. If she retracts commitment to *A*, then she should either retract commitment to *B* or retract commitment to *C*. What if Wilma decides, after critical questioning by Bruce, to retract commitment

to *C*? Then she should face another choice. She must now either retract commitment to *D* or retract commitment to *E*.

The general policy of stability adjustment as a solution to the problem of retraction is as follows. If an arguer in a persuasion dialogue retracts commitment to a conclusion of a linked argument, then she must retract commitment to at least one of the premises. If the argument is convergent, she must retract both (or all) premises. If the argument is serial, then she must go back up the chain of arguments, as indicated in the example above, and make all the required retractions along the way, as far as the chain extends. This policy on retractions does impose a kind of penalty on arguer, so that she will not make retractions of commitments too freely. For unless she also retracts the related propositions in her commitment store – which she may not want to do, and which may take some time and effort – she is not allowed to retract any particular proposition. The general policy means that an arguer is free to retract commitment to any propositions that are not intimately related to his central position, but is more restricted when it comes to retraction of propositions that are more centrally related to his main lines of argumentation within his commitment set.

At any rate, stability adjustment is one proposed solution to the problem of retraction in persuasion dialogue. Whether it will turn out to be the best solution remains to be seen. Whether there may be different kinds of persuasion dialogue, in which different solutions for the problem of retraction are more useful, also remains to be seen. For the moment, the problem of retraction has been posed, and one proposed solution has been shown. Future work on dialogue theory will be concerned with devising appropriate rules of retraction for the various types of dialogue represented in Table 1 above.

5. COMMUNICATION AND INFORMATION

Dialogue theory looks to be extremely useful to model the fundamental notion of communication that is the basis of so much human activity, in business, advertising, sociology, and so many affairs of life and learning. But communication, judging from what has been written about it in the field of communication studies, has been a problematic notion to define. Communication has been defined many different ways by the many authors who have written on the subject of communication (Craig 1999), but central to many of these definitions is the notion that communication is the transfer of information. For example according to the definition of ‘communication’ presented by Kimura (1993, 3), “The term is used here in a narrower sense, to refer to the behaviors by which one member of a

species conveys information to another member of the species". But what exactly is information? According to the mathematical definition given by Shannon and Weaver (1972), information is defined as reduction of uncertainty, measured by the change in probability values in a field of events. What this mathematical formula is supposed to measure is whether the type of response selected by a receiver is causally influenced by the type of message selected by the sender (Hauser 1996, 8). Whether this narrow and technical concept of information is adequate to represent the right meaning of the term needed to understand the structure of information-seeking dialogue is an open question.

The more important observation here is that from the viewpoint of dialogue theory, information-seeking dialogue is just one type of dialogue framework of communication in which argumentation takes place. The persuasion dialogue, the inquiry, deliberation, negotiation and eristic dialogue also represent important kinds of goal-directed communication. But surely the goal of each of these five types of dialogue is not just the conveying of information. Well, yes, that is right, according to the new dialectic, but of course it all depends on how you define 'information'. If that term is defined broadly and inclusively enough, and perhaps also neutrally enough – for example, in terms of increase or decrease in probability values in a series of messages – then just about anything that happens in a dialogue could count as transfer of information.

Let's take the case of persuasion dialogue, because that is a type of communication that has been seen as especially important for rhetoric as a subject. The goal of the dialogue as a whole is to resolve a designated conflict of opinions, or at least to reveal the strongest arguments on both sides of the issue. As indicated above, the goal of the one party is to get the other party to accept his or her (the first party's) thesis, which is one of the propositions on the one side of the conflict of opinions. This one party tries to accomplish this task by using arguments that have commitments of the other party as premises. The task is carried out in a series of small steps making up a longer, connected sequence of moves. That is the essence of persuasion dialogue in a nutshell. But now how can persuasion dialogue, so conceived, be seen as a form of communication that represents a transmitting of information from the one party to the other? Well, one could say that persuasion, so conceived is a transmission of information, because each party is coming to find out all the reasons that support not only her own thesis, but also that of the other side. And this finding of reasons, or supporting arguments, is a kind of increase of information. This move seems fairly plausible (not to me, but it will to many readers). So here the problem is that it is hard to exclude any kind of communication from being

classified as a transfer of information, provided the term ‘information’ is construed broadly and inclusively enough. The problem is exactly that. The term ‘information’ is currently, in fact, used as such a flexible and catch-all category that it hardly seems to exclude anything encompassed by any form of communication that has a cognitive aspect. For example, if you put the key word ‘information’ into a search in a library catalogue or other bibliographical data base, you will get huge numbers of hits with that word in the title. Most of them will be in the field of computing, and most of them will have little if anything directly to do with the narrower sense of the term used in the new dialectic. ‘Information’ is one of those terms like ‘relevance’ that has become a so-called “rag-bag” category into which you can conveniently throw anything that is unclear or not well understood.

The solution or way out of this problem is to overcome the old positivistic idea that information is something solid and objective, like “the facts”, that needs to be measured objectively, quantifiably and operationally, as bits transferred over a wire, or as increase or decrease in probability values. Instead, information-seeking needs to be seen as a distinctive type of dialogue concept in which a set of propositions is transferred from one party to another. But it is not just any old set of propositions that should qualify. Information needs to be seen as a set of propositions that supposedly represents the real facts of a case, or at least part of a plausible account of what happened in a case. The concept is simple enough in some cases. For example, if I ask you what color Cher’s hair is, you may provide that information by stating the proposition, ‘Cher’s hair is black’. If Cher’s hair is in fact black, then you have given me the requested information. But the problem with many other cases is that I may need information, but I am not sure exactly which specific propositions I need to find, or what questions I should ask, right at the beginning of the search. For example, if am starting a research project on air pollution in Chicago, I am not sure what I might find. So I just start searching around for information that seems relevant. When I get relevant information, I then try to evaluate its accuracy and reliability by comparing it with other information, and otherwise critically judging its worth.

Once the concept of communication is viewed in a broader way than this narrowly positivistic way, it becomes clear how information-seeking dialogue is an important type of dialogue in its own right, as a framework of argumentation. There are other highly significant types of dialogue as well that need to be considered under dialogue theory as representing distinctive types of communication. But once the problem of modeling information-seeking dialogue as one type within other types of dialogue is solved, the way is clear to adopt dialogue theory as the core structure un-

derlying not only argumentation theory but communication theory as well. Thus once dialogue theory comes to be accepted as a formal structure in which argumentation can be modeled, it will have a life of its own as a theory. Then it will be quite natural to extend it as a model of communication generally.

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Department of Philosophy
University of Winnipeg
Winnipeg, Manitoba
R3B 2E9 Canada
E-mail: douglas.walton@uwinnipeg.ca