

CHAPTER 8.

HOW THE CONTEXT OF DIALOGUE OF AN ARGUMENT INFLUENCES ITS EVALUATION

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Abstract: A common theme of the Canadian approach to informal logic is to take as its central tasks the identification, analysis and evaluation of real arguments found in natural language discourse. Along with this came the recognition of taking factors of the context of dialogue in the given case, such as burdens and standards of proof, into account by ascending to the so-called dialectical tier. This paper surveys how the resulting typology of dialogues has had applications in many fields. It is shown that distinctions between the various kinds of dialogue can be clarified and formulated more precisely by showing how each of them relies on different approaches to the burden of proof.

The understanding of argumentation as dialectical in nature was central to the founding of informal logic as a tool for evaluating arguments in natural language discourse by transcending the traditional ideal of a good argument being one that is deductively valid and has true premises (Blair and Johnson, 1987, 41). The meaning of the term 'dialectical' that they use, said to borrow heavily from Aristotle's account of dialectical argumentation, sees argument as a process in which two parties participate, one

having the role of questioner and the other having the role of answerer of these questions (45). Moreover, they also characterized argumentation as a purposive activity in which each of the participants has a goal guiding his or her moves in the dialogue (46). Johnson (2003) acknowledged the importance of this notion of dialectical argumentation further when he focused on the use of argument to achieve rational persuasion by introducing what he called a dialectical tier postulating that the arguers engaging in a dialogue have dialectical obligations and responsibilities.

Adoption of this kind of dialectical viewpoint in recent logic, even though it was very much a minority view at the time, was pioneered by Hamblin (1970) who built formal dialectical systems that borrowed from Aristotle's account of dialectical argumentation, and rejected the view that the traditional idea of a deductively valid argument with true premises could cope with problems of evaluating real arguments. However, Hamblin (1971) did not explicitly classify such formal dialogues as having the purpose of rational persuasion, but portrayed them as having an information-seeking goal. Hamblin made no attempt to systematically classify different types of dialogue representing goal-directed frameworks in which argumentation takes place. This task was subsequently carried out by Walton and Krabbe (1995). This work has had many citations¹, as its dialogue typology has had applications in many different fields, including artificial intelligence, law, medicine, discourse analysis, linguistics (especially pragmatics) and education (Rapanta et al., 2013). The purpose of this paper is to survey many of these applications to see how they fit with informal logic.

Section 1 introduces the reader who is not familiar with the typology of the different types of dialogue in argumentation to explain the basic concepts in this area and the motivations for applying formal models of dialogue to study examples and characteristics of natural language arguments. The dialogue typology

1. There have been 1,701 citations according to Google, as of September 13, 2017.

of Walton and Krabbe (1995) is explained, and it is mentioned how one new type, discovery dialogue, has been added in. The basic ideas behind persuasion dialogue, inquiry dialogue, deliberation dialogue, and the notion of the dialectical shift from one type of dialogue to another, are introduced. Section 2 introduces the reader to the basic characteristics of persuasion dialogue, presenting a precise definition of persuasion dialogue and a simple example of it. Section 3 also briefly explains how legal argumentation of the kind found in the common law trial setting has been shown to be a species of persuasion dialogue by introducing the important notions of burden of persuasion and burden of proof. Beginning with an example of deliberation in a real doctor-patient consultation in the field of medicine, section 3 outlines the basic concepts and characteristics of deliberation dialogue, drawing on the recent literature on deliberation in artificial intelligence, where formal models of this type of dialogue have been built. Section 4 offers advice on the commonly encountered problem of how to tell whether an example of real argumentation within the context should be classified as that of a persuasion dialogue or deliberation dialogue. Sections 5, 6, and 7 briefly outline the main characteristics of the inquiry, the discovery and the information-seeking types of dialogue. Very brief outlines of the characteristics of the negotiation dialogue and the eristic type of dialogue are presented in sections 8 and 9. Section 10 provides some conclusions.

2. TYPES OF DIALOGUE AND DIALECTICAL SHIFTS

The six basic types of dialogue previously recognized in the argumentation literature (Walton and Krabbe, 1995) are persuasion, inquiry, negotiation dialogue, information-seeking dialogue, deliberation, and eristic dialogue. Discovery dialogue (McBurney and Parsons, 2001) has been added in the revised list of the properties of the basic types of dialogue in Table 1. These dialogues are technical artifacts called normative models,

meaning that they do not necessarily correspond exactly to real instances of persuasion or negotiation, and so forth, that may occur in a real conversational exchange. Each model of dialogue is defined by its initial situation, the participants' individual goals, and the aim of the dialogue as a whole.

TYPE OF DIALOGUE	INITIAL SITUATION	PARTICIPANT'S GOALS	GOAL OF DIALOGUE
<i>Persuasion</i>	Conflict of Opinions	Persuade Other Party	Resolve or Clarify Issue
<i>Inquiry</i>	Need to Have Proof	Find and Verify Evidence	Prove (Disprove) Hypothesis
<i>Discovery</i>	Need to Find an Explanation of Facts	Find and Defend a Suitable Hypothesis	Choose Best Hypothesis for Testing
<i>Negotiation</i>	Conflict of Interests	Get What You Most Want	Reasonable Settlement Both Can Live With
<i>Information-Seeking</i>	Need Information	Acquire or Give Information	Exchange Information
<i>Deliberation</i>	Dilemma or Practical Choice	Co-ordinate Goals and Actions	Decide Best Available Course of Action
<i>Eristic</i>	Personal Conflict	Verbally Hit out at Opponent	Reveal Deeper Basis of Conflict

Table 1: Seven Basic Types of Dialogue

A dialogue is formally defined as an ordered 3-tuple $\{O, A, C\}$ where O is the opening stage, A is the argumentation stage, and C is the closing stage (Gordon and Walton, 2009, 5). Dialogue rules (protocols) define what types of moves are allowed by the parties during the argumentation stage (Walton and Krabbe, 1995). At the opening stage, the participants agree to take part in some type of dialogue that has a collective goal. Each party has an individual goal and the dialogue itself has a collective goal. The initial situation is framed at the opening stage, and the dialogue

moves through the opening stage toward the closing stage. The type of dialogue, the goal of the dialogue, the initial situation, the participants, and the participant's goals are all set at the opening stage. In some instances, a burden of proof, called a global burden of proof, is set at the opening stage, applies through the whole argumentation stage, and determines which side was successful or not at the closing stage. In some instances, another kind of burden of proof, called a local burden of proof, applies to some speech acts made in moves during the argumentation stage (Walton, 2014).

Persuasion dialogue is adversarial in that the goal of each party is to win over the other side by finding arguments that defeat its thesis or casts it into doubt. Each party has a commitment set (Hamblin, 1970), and to win, a party must present a chain of argumentation that proves its thesis using only premises that are commitments of the other party. One very well known type of dialogue that can be classified as a type of persuasion dialogue is the critical discussion (van Eemeren and Grootendorst, 1992). The goal of a critical discussion is to resolve a conflict of opinions by rational argumentation. The critical discussion has procedural rules, but is not a formal model. However, the term 'persuasion dialogue' has now become a technical term of argumentation technology in artificial intelligence and there are formal models representing species of persuasion dialogue (Prakken, 2006).

Inquiry is quite different from persuasion dialogue because it is cooperative in nature, as opposed to persuasion dialogue, which is highly adversarial. The goal of the inquiry, in its paradigm form, is to prove that a statement designated at the opening stage as the *probandum* is true or false, or if neither of these findings can be proved, to prove that there is insufficient evidence to prove that the *probandum* is true or false (Walton, 1998, chapter 3). The aim of this type of inquiry is to draw conclusions only from premises that can be firmly accepted as true or false, to pre-

vent the need in the future to have to go back and reopen the inquiry once it has been closed. The most important characteristic of this paradigm of the inquiry as a type of dialogue is the property of cumulateness (Walton, 1998, 70). To say a dialogue is *cumulative* means that once a statement has been accepted as true at any point in the argumentation stage of the inquiry, that statement must remain true at every point in the inquiry through the argumentation stage until the closing stage is reached. However, this paradigm of inquiry represents only one end of a spectrum where a high standard of proof is appropriate. In other inquiry settings, where there are conflicts of opinion and greater uncertainty, cumulateness fails, but cooperativeness is a characteristic of inquiry. The model of inquiry dialogue built by Black and Hunter (2009) is meant to represent the cooperative setting of medical domains. Black and Hunter (2009, 174) model two subtypes of inquiry dialogue called in argument inquiry dialogues and warrant inquiry dialogues. The former allow two agents to share knowledge to jointly construct arguments, whereas the latter allow agents to share knowledge to construct dialectical trees that have an argument at each node in which a child node is a counterargument to its parent.

Inquiry dialogue can be classified as a truth-directed type of dialogue, as opposed to deliberation dialogue, which is not aimed at finding the truth about that matter being discussed, but at arriving at a decision on what to do, where there is a need to take action. While persuasion dialogue is highly adversarial, deliberation is a collaborative type of dialogue in which parties collectively steer actions towards a common goal by agreeing on a proposal that can solve a problem affecting all of the parties concerned, taking all their interests into account. To determine in a particular case whether an argument in a text of discourse can better be seen as part of a persuasion dialogue or a deliberation type of dialogue, one has to arrive at a determination of what the goals of the dialogue and the goals of the participants are sup-

posed to be. Argumentation in deliberation is primarily a matter of identifying proposals and arguments supporting them and finding critiques of other proposals (Walton et al., 2009). Deliberation dialogue is different from negotiation dialogue, because the negotiation deals with competing interests, whereas deliberation requires a sacrifice of one's interests.

Deliberation is a collaborative type of dialogue in which parties collectively steer group actions towards a common goal by agreeing on a proposal that can solve a problem affecting all of the parties concerned while taking their interests into account. A key property of deliberation dialogue is that a proposal that is optimal for the group may not be optimal for any individual participant (McBurney et al., 2007, 98). Another property is that a participant in deliberation must be willing to share both her preferences and information with the other participants. This property does not hold in persuasion dialogue, where a participant presents only information that is useful to prove her thesis or to disprove the thesis of the opponent. In the formal model of deliberation of McBurney et al. (2007, 100), a deliberation dialogue consists of eight stages: open, inform, propose, consider, revise, recommend, confirm and close. Proposals for action that indicate possible action-options relevant to the governing question are put forward during the propose stage. Commenting on the proposals from various perspectives takes place during the consider stage. At the recommend stage a proposal for action can be recommended for acceptance or non-acceptance by each participant (Walton et al., 2010).

A dialectical shift is said to occur in cases where, during a sequence of argumentation, the participants begin to engage in a different type of dialogue from the one they were initially engaged in (Walton and Krabbe, 1995). In the following classic case (Parsons and Jennings, 1997, 267) often cited as an example, two agents are engaged in deliberation dialogue on how to hang a picture. Engaging in practical reasoning they come to the con-

clusion they need a hammer, and a nail, because they have figured out that the best way to hang the picture is on a nail, and the best way to put a nail in the wall is by means of a hammer. One knows where a hammer can be found, and the other has a pretty good idea of where to get a nail. At that point, the two begin to negotiate on who will get the hammer and who will go in search of a nail. In this kind of case, we say that the one dialogue is said to be embedded in the other (Walton and Krabbe, 1995), meaning that the second dialogue fits into the first and helps it along toward achieving its collective goal. In this instance, the shift to the negotiation dialogue is helpful in moving the deliberation dialogue along towards its goal of deciding the best way to hang the picture. For after all, if somebody has to get the hammer and nail, and they can't find anyone who is willing to do these things, they will have to rethink their deliberation on how best to hang the picture. Maybe they will need to phone a handyman, for example. This would mean another shift to an information-seeking dialogue, and involvement of a third party as a source of the information. This example of an embedding contrasts with an example of an illicit dialectical shift when the advent of the second type of dialogue interferes with the progress of the first. For example, let's consider a case in which a union-management negotiation deteriorates into an eristic dialogue in which each side bitterly attacks the other in an antagonistic manner. This kind of shift is not an embedding, because quarreling is not only unhelpful to the conduct of the negotiation, but is antithetical to it, and may very well even block it altogether, by leading to a strike for example.

3. PERSUASION DIALOGUE

Here is a simple example of a persuasion dialogue adapted from an example of Prakken, 2006 (166), presented in the format of Table 2. There are two parties, Olga and Paul, who take turns making moves. Each move contains a speech act, such as asking

a question or making an assertion. A so-called *adjacency pair* is a pair of speech acts one following the other. The Z column numbers the adjacency pairs in Table 2. According to Schegloff and Sacks (1973), adjacency pairs are sequences of two utterances that are (1) adjacent, (2) produced by different speakers, (3) ordered as a first part and a second part, and (4) typed, so that a particular first part requires a particular second part (or range of second parts) (Levinson, 1983, 303). For example, a why-question (of a certain type) demands an answer that offers an argument supporting a statement that is in question or has been claimed by the other party.

Z	Olga	Paul
1	Why is your car safe?	Since it has an airbag.
2	That is true, but this does not make your car safe.	Why does that not make my car safe?
3	Since the newspapers recently reported on airbags expanding without cause.	OK, but newspaper reports are unreliable sources of technological information.
4	Still your car is not safe, because its maximum speed is very high.	But it says in Consumer's Reports, a reliable source, that this type of car is safe.
5	Even so, if a car has a maximum speed that is very high, we cannot say that it is safe.	In some cases, having rapid acceleration enables a driver to avoid an accident.

Table 2: Argumentation Stage in the Airbag Example

The central characteristic of a persuasion dialogue is that each party has the goal of persuading the other party that their thesis is true where, at the opening stage of dialogue, there is disagreement about whether some designated proposition is true (acceptable, based on the evidence) or not. Each side tries to rationally persuade the other to reverse its original opinion using arguments with premises the other party already accepts or can be gotten to accept by further arguments. Rational persuasion, in

this sense can be defined using the following four-part precis-ing definition: *a rationally persuades b* to accept claim *C* iff (1) *b* does not accept *C*, (2) *a* presents an argument A_i with premises P_1, P_2, \dots, P_n such that (3) *b* accepts all of P_1, P_2, \dots, P_n , and (4) A_i is valid, according to the criteria for validity of arguments set in place at the opening stage. In any instance of dialogue where all four requirements are met by *a*'s argumentation, *b* is rationally obliged to accept *C*, unless *b* can present further arguments against *C*. Whether or not *b* is allowed to do this depends on whether the closing stage of the dialogue has been reached.

For those familiar with argumentation theory, the notion of the persuasion dialogue is reminiscent of the type of dialogue called the critical discussion defined by a set of rules in the pragma-dialectical model. In all three versions of their set of rules for the critical discussion van Eemeren and Grootendorst set down a particular rule that governs burden of proof. In the 1992 version (van Eemeren and Grootendorst, 1992, 208), the rule governing burden of proof is simple. It only requires that "a party that advances the standpoint is obliged to defend it if the other party asks him to do so". For example, rule 8a of the formal dialogue system PPD (Walton and Krabbe, 1995, 136) says, "If one party challenges some assertion of the other party, the second party is to present, in the next move, at least one argument for that assertion". Hahn and Oaksford (2007, 47) have questioned whether van Eemeren and Grootendorst need to have rule 3 requiring burden of proof in a critical discussion. They think it makes sense to have a burden of proof for a participant's ultimate thesis set forth at the opening stage of the critical discussion, but they question why it is useful for each individual claim in the argumentative exchange to have an associated burden of proof. They concede that although there is a risk of non-persuasion in not responding to a challenge by putting forward an argument to defend one's claim, this risk is a relatively small factor in the outcome of the dialogue and "is entirely external

to the dialogue and not a burden of proof in any conventional sense” (Hahn and Oaksford, 2007, 47). They have a point. It is worth asking what function the requirement of burden of proof has in a persuasion dialogue.

The addition of a third party audience to the persuasion dialogue affects brings out the utility of this function. If a party in a persuasion dialogue puts forward an argument, and then fails to defend it when challenged to do so, this failure will make his side appear weak to the audience who is evaluating the argumentation on both sides. They will ask why he put forward this particular claim if he can't defend it, and he may easily lose by default. This can come about because the audience has the role of being a neutral third party in the dialogue, and is not merely one of the contestants who is trying to get the best of the opposed party. It helps the audience to judge which side had the better argument if each side responds to challenges by putting forward arguments to support its claims. Law is an area where there is such a third party trier (a judge or jury) in addition to the opposed advocates on each side.

In legal argumentation, burden of proof rests on the notion that there are different standards of proof (Gordon and Walton, 2009; Walton, 2014, 57-61). The standard required in most civil cases is called that of the preponderance of evidence, sometimes also called the balance of probabilities (Gordon and Walton, 2009). According to this standard, a proposition is acceptable if it is more likely to be true than not true. There is also a standard of proof called clear and convincing evidence, which is taken to be higher than a preponderance of evidence standard and is only met if the proposition is not only substantially more probable but also there is a firm belief that it is true. According to the beyond reasonable doubt standard, applicable in criminal cases, there can be no reasonable doubt that a proposition is true given the evidence supporting it, and the lack of evidence against it. In gen-

eral a burden of proof relates to the level of certainty required in order to prove a proposition that is in doubt.

In legal argumentation of the kind found in a common law trial setting (a species of persuasion dialogue), there is a burden of persuasion set at the opening stage of a dialogue, and a burden of production of evidence is set during the argumentation stage (Gordon and Walton, 2009). But there is also a tactical burden of proof that plays an important role in the formal system for modeling burden of proof of Prakken and Sartor (2009, 228). On their account, the burden of persuasion specifies which party has to prove some proposition that represents the ultimate *probandum* in the case, and also specifies what proof standard has to be met. The judge is supposed to instruct the jury on what proof standard has to be met and which side estimated at the beginning of the trial process. Whether this burden has been met or not is determined at the end of the trial. The burden of persuasion remains the same throughout the trial, once it has been set. It never shifts from the one side to the other during the whole proceedings (Prakken and Sartor, 2007). The burden of production specifies which party has to offer evidence on some specific issue that arises during a particular point during the argumentation in the trial itself as it proceeds. The burden of production may in many instances only have to meet a low proof standard. If the evidence offered does not meet the standard, the issue can be decided as a matter of law against the burden party, or decided in the final stage by the trier (Prakken and Sartor, 2006). Both the burden of persuasion and the burden of production are assigned by law. The tactical burden of proof, on the other hand is decided by the party putting forward an argument at some stage during the proceedings. The arguer must judge the risk of ultimately losing on the particular issue being discussed at that point if he fails to put forward further evidence concerning that issue (Prakken and Sartor, 2007). The tactical burden is not ruled on or moderated by the judge. It pertains only to the two parties con-

testing on each side, enabling them to plan their argumentation strategies.

This research on burden of proof in artificial intelligence and law (Prakken and Sartor, 2006, 2007, 2009; Gordon and Walton, 2009) rests on the assumption that legal argumentation of the kind that takes place in a common law court setting fits the context of a persuasion dialogue.

4. DELIBERATION DIALOGUE

Lamiani et al. (2017) applied the formal model of deliberation dialogue of Walton, Toniolo and Norman (2014) to real doctor-patient consultations in the field of hemophilia, a rare inherited bleeding disorder that requires patients to comply with burdensome treatments. It was concluded by their study of 30 consultations that the deliberation model can be applied to empirical data showing how to identify and remedy physician-patient deliberation interactions that are suboptimal. A particularly interesting finding (Lamiani et al., 2017, 691) was that the topic can shift during a deliberation dialogue as each problem that arises needs to be solved, during a visit. Studying transcripts of these consultations between physician and patient, they found that there could be more than one deliberation dialogue. This finding confirms the basic feature of deliberation dialogue postulated in the model, namely that the topic of the deliberation can shift during the argumentation stage. Thus a contrast can be drawn in this respect between deliberation dialogue and persuasion dialogue. In the latter, the topic is fixed at the opening stage and remains fixed at the closing stage. In this instance the application of the theoretical model to examples of real clinical dialogues confirmed a characteristic postulated in the theoretical model.

In the following example, (Lamiani et al., 2017, 693), the patient shares his arguments explaining why he does not want to start the cure proposed by the physician. Nevertheless at the end of the dialogue agreement is reached as the patient explicitly

expresses his commitment to the physician's proposal for treatment (at the closing stage). The dialogue has been quoted but some details have been simplified and shortened.

Opening Stage

MD: Why did they write 'previous viral hepatitis'? Do you still have hepatitis?

Patient: Yes.

MD: So you didn't undergo treatment in the meantime?

Patient: No, no, no! I'm not doing any treatment...

Patient: Are there people who are already doing this therapy?

MD: Well, everybody! Basically all of our patients are doing it! So absolutely you should also do it! Do you want to?

Patient: No

MD: Why?

Argumentation Stage

Patient: Because I feel good the way I am now.

MD: Yes, I know you feel good. However, the hepatitis virus is silent for 30 years and when it wakes up then there is nothing more you can do!

Patient: Why, can this virus go away?

MD: There is an 80% probability of success!

Patient: Yes I know, because I am a bit special.

MD: Explain to me. Let's talk about it!

Patient: I have always been against all sorts of drugs and I have never taken medicine all my life, not even for flu. And you had talked to me about the interferon also three years ago.

MD: And will keep on doing it! We absolutely recommend you to do the therapy. I repeat, to start does not mean that if the side effects are too heavy we tie you to a chair and make you go on. We decide together. If we give it a try,

there are too many side effects and we stop. It's not a problem. The virus doesn't become more resistant

Closing Stage

Patient: Yes, okay

MD: Very well, so I'm writing that for us it will be useful to do it. And if you want to do it here it's okay

Patient: Yes I'd better do it when I do the other treatment.

The findings showed that 80% of the sample of consultations contained at least one deliberation dialogue, suggesting that deliberation is common in clinical practice and chronic care. In the study, the model of deliberation was taken as an ideal model of optimal deliberation so that the study of empirical examples could be used to identify misalignments with the model, or cases where there were suboptimal realizations of the ideal model. The intent of applying the model to real consultations was to offer practical suggestions to improve collaborative physician-patient communication in hemophilia care. Note that in the case outlined above all three stages were present, but in some cases regarded as suboptimal, either the opening stage or the closing stage was missing.

The types of dialogue that have been centrally highlighted in the past in the argumentation literature, such as the critical discussion, concern claims that are put forward in the form of a proposition that is held to be true or false. But other types of dialogue, such as deliberation and negotiation, do not have the central aim of proving that a particular proposition is true or false.

There is no global burden of proof in a deliberation dialogue, because no thesis to be proved or disproved is set into place for each side at the opening stage (Walton, 2010). Deliberation is not an adversarial type of dialogue, and at the opening stage all options are left open concerning proposals that might be brought forward to answer the governing question. At the opening stage,

the governing question cites a problem that needs to be solved cooperatively by the group conducting the deliberations, a problem that concerns choice of actions by the group. The goal of the dialogue is not to prove or disprove anything, but to arrive at a decision on which is the best course of action to take. Hence the expression 'burden of proof' is not generally appropriate for this type of dialogue.

During a later stage, proposals for action are put forward, and what takes place during the argumentation stage is a discussion that examines the arguments both for and against each proposal, in order to arrive at a decision on which proposal is best. Something like the standard of proof called the preponderance of evidence in law is operative during this stage. The outcome in a deliberation dialogue should be to select the best proposal, even if that proposal is only marginally better than others that have been offered. A party who offers a proposal is generally advocating it as the best course of action to take, even though in some instances a proposal may merely be put forward hypothetically as something to consider but not necessarily something to adopt as the best course of action. In such instances it is reasonable to allow one party in a deliberation dialogue to ask another party to justify the proposal that the second party has put forward, so that the reasons behind it can be examined and possibly criticized. Hence there is a place in deliberation dialogue for something comparable to burden of proof. It could be called a burden of defending or justifying a proposal. What needs to be observed is that this burden only comes into play during the argumentation stage where proposals are being put forward, questioned and defended. In contrast with the situation in persuasion dialogue, none of these proposals is formulated and set into place at the opening stage as something that has to be proved or cast into doubt by one of the designated parties in the dialogue. In this regard, persuasion dialogue and deliberation are different in their structures. Since persuasion dialogue (the critical dis-

cussion type of dialogue) has been most discussed in the argumentation literature, it seems natural to think that there must be something comparable to burden of proof that is also operative in deliberation dialogue. But this expectation is misleading.

In deliberation dialogue, there is no burden of persuasion set at the opening stage, because the proposals will only be formulated as recommendations for particular courses of actions at the later argumentation stage. A deliberation dialogue arises from the need for action, as expressed in a governing question formulated at the opening stage, like ‘Where shall we go for dinner tonight?’, and proposals for action arise only at a later stage in the dialogue (McBurney et al, 2007, 99). There is no burden of proof set for any of the parties in a deliberation at the opening stage. However, at the later argumentation stage, once a proposal has been put forward by a particular party, it will be reasonably assumed by the other participants that this party will be prepared to defend his proposal by using arguments, for example like the argument that his proposal does not have negative consequences, or the argument that his proposal will fulfill some goal that is taken to be important for the group. How burden of proof figures during the argumentation stage can be seen by examining some of the permissible locutions (speech acts allowed as moves). One of these is the *ask-justify* locution (McBurney et al., 2007, 103), quoted below. The locution **ask_justify** (P_j , P_i , $type$, t) is a request by participant P_j of participant P_i , seeking justification from P_i for the assertion that sentence t is a valid instance of type $type$. Following this, P_i must either retract the sentence t or shift into an embedded persuasion dialogue in which P_i seeks to persuade P_j that sentence t is such a valid instance

What we see here is that one participant in a deliberation dialogue can ask another participant to justify a proposition that the second party has become committed to through some previous move of a type like an assertion or proposal. As long as the proposition is in the second party’s commitment set, the first

party has a right to ask him to justify it or retract it. But notice that when the second party offers such a justification attempt, the dialogue shifts into an embedded persuasion dialogue in which the second party tries to persuade the first party to become committed to this proposition by using a valid argument. So what we see here is that burden of proof is involved during specific groups of moves at the argumentation stage, but when the attempt is made by the respondent to fulfill the request for justification, there is a shift to persuasion dialogue. By this means the notion of burden of proof appropriate for the persuasion dialogue can be used to evaluate the argument offered.

A key factor that is vitally important for persuasion dialogue is that the participants agree on the issue to be discussed at the opening stage. Each party must have a thesis to be proved. This setting of the issue is vitally important for preventing the discussion from wandering off, or by shifting the burden of proof back and forth and never concluding. In deliberation dialogue however, the proposals are not formulated until a later stage. It makes no sense to attempt to fix the proposals at the opening stage, because they need to arise out of the brainstorming discussions that take place after the opening stage. Burden of proof only arises during the argumentation stage in relation to specific kinds of moves made during that stage, and when it does arrive there is a shift to persuasion dialogue which allows the appropriate notion of burden of proof to be brought in from the persuasion dialogue.

For these reasons the speech act protocols for deliberation dialogue need to be configured so that one agent can ask another about the plans and goals of the second agent, and the second agent can offer an explanation about its own plans and goals (Walton, Toniolo and Norman, 2016). In general, an agent in a deliberation dialogue often needs to be able to explain its plans and goals, as well as its knowledge of the current circumstances of the case, to another agent who questions a proposal that has

been put forward by the first agent. Thus there is a kind of burden on the first agent in such a case to offer explanations and clarifications that the other agents in the deliberation dialogue can understand. If one agent is a problem because he does not understand some aspect of another agent's proposal, the proposer needs to explain his plan in a way that responds to the questioner's problem. The need to respond in this way, however, is better described not as a burden of proof but as a burden of responding constructively (Walton, Toniolo and Norman, 2016, 12).

5. DECIDING BETWEEN PERSUASION AND DELIBERATION

It is a fundamental but common problem in trying to apply a formal dialogue model to examples of real argumentation that there is disagreement in many instances about whether a given argument should be classified as taking place in the context of a persuasion dialogue or that of a deliberation dialogue. To see the problem consider some examples. The pervasiveness of the problem can be indicated by listing the topics of some recently featured debates in Debatepedia.

- Should there be a ban on sales of violent video games to minors?
- Should colleges ban fraternities?
- Should public schools be allowed to teach creationism alongside evolution?
- Should governments legalize all drugs?

A student encountering these debates armed with the distinction between persuasion dialogue and deliberation would at least initially be tempted to classify them as instances of deliberation dialogue, because in each instance, the topic of the debate concerns

an issue of a choice of actions or policies. Deliberation dialogue is about a decision to decide between different courses of action, or whether to take action or not, on a situation requiring some sort of choice. However, it needs to be noticed in each instance that the debaters discussing the issue are not in a position to make the decision whether to move ahead with the course of action or not, or to choose which action of the opposed pair they will carry out. For example, the debaters concerned with the second issue on the list are not in a position to ban fraternities in all colleges or decide not to. This observation might prompt the student to reconsider, and classify the examples as persuasion dialogues.

But on the other hand there is a problem with that, because a persuasion dialogue is about a conflict of opinions where each opinion is a statement that is true or false. And very often the criterion used to distinguish between persuasion dialogues and deliberation dialogues is that the latter are about actions whereas the former are about whether a particular factual proposition is true or false.

The solution to the problem is to recognize that there can be persuasion over action, so just because in a given instance argumentation is about a course of action, it does not follow that the context has to be that of a deliberation dialogue. This lesson can be brought out even more forcefully by considering a simple example (Atkinson et al, 2013) of a group of academics at the end of a day of conferencing who need to make a decision on where to go for dinner. Some of them make proposals about certain restaurants they have some experience with, while others of them give reasons to support a claim to the effect that one or the other of the restaurants being considered would be less than ideal. For example, one of the participants might argue that a particular restaurant proposed by one of the others does not have vegetarian food. Or another participant might argue that his time is limited and one of the restaurants recommended by another

person is too far away, and would therefore take too much time to get to and back from.

A complicating factor revealed by the study of this example is that there are frequently shifts from the one type of dialogue to the other. For example if one participant argues that this restaurant is too far away while the other argues it is really not too far away, they might shift to a persuasion dialogue on this issue by presenting what purport to be facts about how long it would take to get to this restaurant and back given the kinds of transportation available in the city. This kind of shift is typical, because intelligent deliberation needs to be based on the participants' knowledge of the circumstances of the case. Once there has been a shift to arguing about the factual issues of this kind of the dialogue may have shifted from deliberation to a persuasion dialogue or an information seeking dialogue. In other instances a deliberation dialogue may shift to a negotiation, as shown in the example of the hammer and the nail in section 1.

Still other dialogues are not mainly about argumentation. Some are about the giving and receiving of explanations. In this kind of dialogue, there is no burden of proof, because the central aim is not to prove something but to explain something that the questioner claims to fail to understand. However, in this type of dialogue when a questioner asks for an explanation, there is an obligation on the part of the other party to provide one, assuming he is in a position to do that. So generally, in all types of dialogue of the kind that provide normative structures for rational communication, there are obligations to respond in a certain way to a request made in a prior move by the other party. These obligations are quite general, but the notion of burden of proof is more restricted, and only applies where a response to an expression of doubt by one party as to whether some proposition is true or not needs to be made by offering an attempt to prove that the proposition is true or false. For obvious reasons, this type of dialogue exchange is centrally important in science and philoso-

phy, but the problem is that the vocabulary used to describe its operation has a tendency to be carried over into other types of dialogue where the central purpose is not to prove or disprove something.

6. INQUIRY

The type of dialogue where use of the expression ‘burden of proof’ is most clearly appropriate is the inquiry. The aim of the inquiry is to collect sufficient evidence to either definitively prove the proposition at issue, or to show that it can not be proved, despite the exhaustive effort made to collect all the evidence that was available. The central aim of the inquiry is proof, where this term is taken to imply that a high standard of proof has been met. The negative aim of the inquiry is to avoid later retraction of the proposition that has been proved. And so the very highest standard of proof is appropriate. The inquiry is therefore the model of dialogue in which the expression ‘burden of proof’ has a paradigm status.

The goal of an inquiry is to produce solid inferences to prove or disprove some claim at issue using clear concepts and clearly articulating the burden of proof at the opening stage. As a consequence, the evidential standard for the inquiry type of dialogue needs to be high (Upshur and Colak, 2003, 291). In medical contexts this kind of argumentation requires evidence from studies, such as randomized trials, based on a collective research effort where criteria are stipulated in advance to determine the acceptability of the evidence (Upshur and Colak, 2003, 292). Hence there is a need to ensure that all the relevant evidence has been taken into account before closing off the inquiry and reaching a conclusion.

The inquiry as a type of dialogue is somewhat similar to the type of reasoning that Aristotle called a demonstration. On his account (1984, *Posterior Analytics*, 71b26), the premises of a demonstration are themselves indemonstrable, as the grounds of

the conclusion, and must be better known than the conclusion and prior to it. He added (1984, *Posterior Analytics*, 72b25) that circular argumentation is excluded from a demonstration. He argued that since demonstration must be based on premises prior to and better known than the conclusion to be proved, and since the same things cannot simultaneously be both prior and posterior to one another, circular demonstration is not possible (at least in the unqualified sense of the term 'demonstration').

In contrast, persuasion dialogues, as well as deliberation dialogues and discovery dialogues, have to allow for retractions. It is part of the rationality of argumentation in a persuasion dialogue that if one party proves that the other party has accepted a statement that is demonstrably false, the other party has to immediately retract commitment to that statement. It does not follow that persuasion dialogue has to allow for retractions in all circumstances, but the default position is that it is presumed that retraction should generally be allowed, except in certain situations. In contrast, in the inquiry, the default position is to eliminate the possibility of retraction of commitments as much as possible, except in certain situations.

Cumulativeness appears to be such a strict model of argumentation that many equate it with the Enlightenment ideal of foundationalism of the kind attacked by Toulmin (1959). To represent any real instance of an inquiry, it is useful to explore inquiry dialogue systems that are not fully cumulative. Black and Hunter (2007) have built a system of argument inquiry dialogues meant to be used in the medical domain to deal with the typical kind of situation in medical knowledge consisting of a database that is incomplete, inconsistent and operates under conditions of uncertainty. The kind of inquiry dialogue they model is represented by a situation in which many different health care professionals rule in the care of the patient, who must cooperate by sharing their specialized knowledge in order to provide the best care for the patient. To provide a standard for soundness and

completeness of this type of dialogue, Black and Hunter (2007, 2) compare the outcome of one of their actual dialogues with the outcome that would be arrived at by a single agent that has as its beliefs the union of the belief sets of both the agents participating in the dialogue. Their model assumes a form of cumulativeness in which an agent's belief set does not change during a dialogue, but they add that they would like to further explore inquiry dialogues to model the situation in which an agent has a reason for removing a belief from its beliefs set it had asserted earlier in the dialogue (Black and Hunter, 2007, 6). To model real instances of argumentation inquiry dialogue, it would seem that ways of relaxing the strict requirement of cumulativeness need to be considered.

One difference between burden of proof in inquiry and persuasion dialogues is that the standard of proof generally needs to be set much higher in the inquiry type of dialogue. A similarity between the two types of dialogue is that the burden of proof, including the standard of proof, is set at the opening stage.

Global burden of proof in a dialogue is defined as a set $\{P, T, S\}$ where P is a set of participants, T is an ultimate *probandum*, a proposition to be proved or cast into doubt by a designated participant, and S is the standard of proof required to make a proof successful. If there is no thesis to be proved or cast into doubt in a dialogue, there is no burden of proof in that dialogue, except where it may enter by a dialectical shift. The local burden of proof defines what requirement of proof has to be fulfilled for a speech act, or move like making a claim, during the argumentation stage. The global burden of proof is set at the opening stage, but during the argumentation stage, as particular arguments are put forward and replied to, there is a local burden of proof for each argument that can change. This local burden of proof can shift from one side to the other during the argumentation stage as arguments are put forward and critically questioned. Once the argumentation has reached the closing stage, the outcome is

determined by judging whether one side or the other has met its global burden of proof, according to the requirements set at the opening stage.

It seems fair to conclude that although the bulk of the literature on burden of proof so far is on persuasion dialogue, it should also be important to investigate burden of proof in inquiry dialogue where it is a central concept. Burden of proof is only significant in deliberation dialogue when there has been a shift to a persuasion dialogue. Burden of proof is important in information-seeking dialogues when arguments need to be brought forward to get permission to receive the information, or when the reliability of the information is a concern. Burden of proof is especially important in the study of scientific argumentation because of the characteristic shift in scientific research from the discovery stage to the inquiry stage.

7. DISCOVERY DIALOGUE

Discovery dialogue was first recognized as a distinct type of dialogue different from any of the six basic types of dialogue by McBurney and Parsons (2001). On their account (McBurney and Parsons, 2001, 4), discovery dialogue and inquiry dialogue are distinctively different in a fundamental way. In an inquiry dialogue, the proposition that is to be proved true is designated prior to the course of the argumentation in the dialogue, whereas in a discovery dialogue the question of the truth to be determined only emerges during the course of the dialogue itself. According to their model of discovery dialogue, participants begin by discussing the purpose of the dialogue, and then during the later stages they use data items, inference mechanisms, and consequences to present arguments to each other. Two other tools they use are called criteria and tests. Criteria, like novelty, importance, cost, benefits, and so forth, are used to compare one data item or consequence with another. The test is a procedure

to ascertain the truth or falsity of some proposition, generally undertaken outside the discovery dialogue.

The discovery dialogue moves through ten stages (McBurney and Parsons, 2001, 5) called open dialogue, discuss purpose, share knowledge, discuss mechanisms, infer consequences, discuss criteria, assess consequences, discuss tests, propose conclusions, and close dialogue. The names for these stages give the reader some idea of what happens at each stage as the dialogue proceeds by having the participants open the discussion, discuss the purpose of the dialogue, share knowledge by presenting data items to each other, discuss the mechanisms to be used, like the rules of inference, build arguments by inferring consequences from data items, discuss criteria for assessment of consequences presented, assess the consequences in light of the criteria previously presented, discuss the need for undertaking tests of proposed consequences, pose one or more conclusions for possible acceptance, close the dialogue. The stages of the discovery dialogue may be undertaken in any order and may be repeated (2001, 6). They add that agreement is not necessary in a discovery dialogue, unless the participants want to have it.

McBurney and Parsons also present a formal system for discovery dialogue in which its basic components are defined. A wide range of speech acts (permitted locutions) that constitute moves in a discovery dialogue include the following: propose, assert, query, show argument, assess, recommend, accept, and retract. There is a commitment store that exists for each participant in the dialogue containing only the propositions which the participant has publicly accepted. All commitments of any participant can be viewed by all participants. They intend their model to be applicable to the problem of identifying risks and opportunities in a situation where knowledge is not shared by multiple agents.

To be able to identify when a dialectical shift from a discovery dialogue to an inquiry dialogue has occurred in a particular case,

we first of all have to investigate how the one type of dialogue is different from the other. Most importantly, there are basic differences in how burden of proof, including the standard of proof, operates. In an inquiry dialogue the global burden of proof, that is operative during the whole argumentation stage, is set at the opening stage. In a discovery dialogue no global burden of proof is set at the opening stage that operates over both subsequent stages of the dialogue. McBurney and Parsons (2001, 418) express this difference by writing that in inquiry dialogue, the participants “collaborate to ascertain the truth of some question”, while in discovery dialogue, we want to discover something not previously known, and “the question whose truth is to be ascertained may only emerge in the course of the dialogue itself”. This difference is highly significant, as it affects how each of the two types of dialogue is fundamentally structured.

In an inquiry dialogue, the global burden of proof is set at the opening stage and is then applied at the closing stage to determine whether the inquiry has been successful or not. This feature is comparable to a persuasion dialogue, where the burden of persuasion is set at the opening stage (Prakken and Sartor, 2007). At the opening stage of the inquiry dialogue, a particular statement has to be specified, so that the object of the inquiry as a whole is to prove or disprove this statement. In a persuasion dialogue, this burden of proof can be imposed on one side, or imposed equally on both sides (Prakken and Sartor, 2006). However, in an inquiry dialogue there can be no asymmetry between the sides. All participants collaborate together to bring forward evidence that can be amassed to prove or disprove the statement at issue. Discovery dialogue is quite different in this respect. There is no statement set at the beginning in such a manner that the goal of the whole dialogue is to prove or disprove this statement. The basic reason has been made clear by McBurney and Parsons. What is to be discovered is not known at the opening stage of the discovery dialogue. The aim of the discovery dialogue is to try to find

something, and until that thing is found, it is not known what it is, and hence it cannot be set as something to be proved or disproved at the opening stage as the goal of the dialogue.

8. INFORMATION-SEEKING DIALOGUE

Information-seeking dialogue is common in healthcare in communicative settings such as physician-patient conversations, relations between physicians, such as between a specialist and a generalist physician, student-teacher interactions, expert consultations and communications with administrators (Upshur and Colak, 2003, page 293). This kind of dialogue is asymmetrical because it is assumed at the opening stage that one party has some information that the other party does not possess. Hence the main characteristic of this type of dialogue is that it is not necessarily truth-seeking. For example the goal may be to have a reasonable enough exchange of information to support a decision. Based on their observations, Upshur and Colak (2003, 293) propose that the evidential standard and information-seeking dialogue is highly contextual and variable. Narrative evidence may be more significant than quantitative evidence.

An important subtype of information-seeking dialogue that has been studied in the argumentation literature is called examination dialogue. Van Laar and Krabbe (2010) classify examination dialogue as a mixture of persuasion dialogue and inquiry. Dunne et al. (2005) take the approach however that examination dialogue should count as a main type of dialogue such as information-seeking and persuasion. Walton (2008) takes examination dialogue to be a species of information-seeking dialogue in which the goal is to acquire some information possessed by the answerer but not by the questioner. The means is to extract this information from the answerer by asking a series of questions. But there is also a secondary aim. This is the testing of the reliability of the information extracted from the respondent (Walton, 2006), for example by testing the answerer's current statement

against his previous ones, or against facts generally known in the case. In the model of examination dialogue of Dunne et al. (2005) the questioner wins if he pins down an inconsistency in the answerer's collective set of responses to questions. This brings in an argumentative element that goes beyond the mere extraction of statements from the possessor of the information, suggesting that it has a testing function as well.

Bolton (1999, 80) used the term *peirastike* (peirastike), as found in Aristotle, to refer to an art of testing claims to knowledge by critically probing into the answerer's set of replies. This critical testing procedure can require the use of different kinds of arguments, such as argument from commitment, especially argument from inconsistent commitments, and certain kinds of *ad hominem* arguments. These observations suggest the view of Walton (2006) that examination dialogue should be classified as a hybrid type of dialogue blending information-seeking dialogue with persuasion dialogue. These matters have not been very widely studied yet, and could use further research, for example on their applications to legal cross-examination dialogues.

There seems to be little to say about burden of proof in information-seeking dialogues at first sight, but there are at least two ways in which burden of proof might enter into this type of dialogue. Information-seeking dialogue is not exclusively taken up with the putting forward of ask and tell questions, or with the kind of searching for information one might do when using Google. One reason is that there is a concern not only with obtaining raw information, but with determining the quality of this information by judging its reliability. Judgments of reliability of collected information would seem to involve standards of proof, and therefore also may involve burdens of proof. Another reason is that in many instances of information-seeking dialogue, the requesting agent needed to provide the responding agent with an argument in order to obtain access to the infor-

mation requested. As noted in Doutre et al. (2006), such dialogues may be viewed as consisting only of ask and tell locutions if this argument component of them is not considered. But if this argument component is considered as part of the information-seeking dialogue, then burden of proof is involved. This might suggest that when agents argue about receiving permission to get information during an information-seeking dialogue, there has been a shift to some other type of dialogue such as a persuasion dialogue.

9. NEGOTIATION DIALOGUE

Since negotiation is really rooted in interests rather than in the pursuit of truth, consideration of the truth or falsity of a statement is subordinate to the exchange or purchase of items of exchange value, such as money (Upshur and Colak, 2003, 292). More important here is the reasonableness or fairness of the bargain. Thus the evidential standard is variable, and the dispute may be resolved reasonably without recourse to empirical evidence (Upshur and Colak, 2003, 291). However, in negotiation dialogue there are typically intervals where there is a shift to another type of dialogue where burden of proof is important. For example a contractor and a homeowner may be negotiating a price for installing a new basement in the house, and at some point in the dialogue it may become important for the contractor to try to convince the homeowner that the building code for walls in basements in that area specifies certain requirements that have to be met, for example discerning the thickness of the walls. In such a case, the notion of burden of proof may not play any direct role in the negotiation argumentation itself, but when there is a shift from it to a persuasion dialogue where the contractor tries to convince the homeowner the walls of a certain minimum thickness are mandatory, burden of proof may be an important factor in evaluating his arguments.

10. ERISTIC DIALOGUE

An eristic dialogue (Walton, 1998, 181) is a combative verbal exchange in which the two participants bring forward their strongest arguments to attack the opponent by any means that might allow them to win the dispute. This type of dialogue was well known to the ancient philosophers, and was known as eristic by them, the expression deriving from the noun *eris* meaning strife or quarrel. Schiappa (1999) suggested that the Greek word for eristic dialogue originated in Plato's writings. Eristic dialogue requires some minimum degree of cooperation, because each of the participants takes a turn in the exchange. However, the rules are very minimal and a central type of argumentation frequently used is the *ad hominem* attack, where each party tries to attack the other personally by arguing that he or she has some personal characteristic indicating untrustworthiness. Because it is characterized by personal attack, the quarrel is typically an emotional type of exchange which seems to break out suddenly and be very intense. Such quarrels are typically sparked by an underlying disagreement or grudge between the two parties that suddenly breaks out into explicit argumentation. Eristic dialogue is not entirely negative, because it often has a cathartic effect as its benefit, allowing underlying antagonisms to be brought to the surface and acknowledged by both parties.

However, eristic dialogues can be dangerous when there has been a shift between another type of dialogue, such as a persuasion dialogue, to the eristic format. Aristotle, in *On Sophistical Refutations* (170 1b5-172 b8) is careful to draw a distinction between dialectical argumentation and eristic argumentation. He identifies eristic argumentation as representing a merely apparent kind of reasoning that appears to be genuine dialectical argumentation but is merely contentious, and is associated with fallacies and sophistical rhetorical tactics. A well-known example in ancient philosophy was the Platonic dialogue called the *Euthydemus*, in which two clever Sophists use all kinds of verbal tricks

and fallacious moves. Aristotle writes in *On Sophistical Refutations* (171 b24-31) that eristic reasoning is an unfair kind of fighting in arguments in which those who are bent on victory at all costs do not hesitate to use any kind of argument that works in the exchange for them. He also links this kind of argumentation to the use of fallacies or sophistical arguments by remarking that the dialogue is eristic if the semblance of victory is the aim, whereas it can be classified as sophistical if a semblance of wisdom is the aim.

As noted by Dufour (2014, 7) there are some differences in how eristic dialogue has been defined in the literature. Walton and Krabbe (1995, 76) define eristic dialogue as a specific kind of dialogue that includes a number of subtypes, one of which is the quarrel while another is the eristic discussion. The eristic discussion is defined by Walton and Krabbe (1995, 76) as a type of dialogue where the participants engage in verbal sparring to show who is the more clever in constructing persuasive but often tricky arguments that devastate the opposition. In the account of Walton (1998, 181), eristic dialogue is defined as a combative verbal exchange in which the two parties are allowed to bring out their strongest arguments to attack, and even to defeat and humiliate the other. Van Laar (2010, 390) defines the eristic discussion as a kind of game that has the aim of determining which of the two parties is the most capable, smart and artful in devising and presenting arguments and criticisms.

These differences on how to precisely define eristic dialogue remain to be resolved, but generally we can say that there is a broad distinction between the simple verbal quarrel, of the kind we are all highly familiar with in everyday conversational argumentation, and the more refined meaning of the sophistical dialogue where two participants engage in verbal sparring to show which of them is the more clever by using persuasive and often tricky arguments to win the exchange by impressing the audience with their argumentation skills.

11. CONCLUSIONS

An important lesson brought out in this paper is that distinctions between the various kinds of dialogue can be clarified and formulated more precisely by showing how each of them relies on different approaches to the burden of proof. A key factor in persuasion dialogue is that the participants agree on the issue to be discussed at the opening stage. Each party must have a thesis to be proved. This setting of the issue is vitally important for preventing the discussion from wandering off, or by shifting the burden of proof back and forth and never concluding. This burden of persuasion comes into play at the local level during the argumentation stage where each party takes turn making its moves. In deliberation dialogue however, the proposals are not formulated until a later stage. It makes no sense to attempt to fix the proposals at the opening stage, because they need to arise out of the brainstorming discussions that take place after the opening stage. Hence in a deliberation dialogue, burden of proof only comes into play during the argumentation stage, and then only in a limited way. In the deliberation itself, there is only a burden of responding constructively by answering a request for justification with a range of replies that moves the dialogue forward. This burden can be fulfilled, for example, by offering an explanation or an argument. For these reasons, in this chapter it is concluded that there is no burden of proof in a deliberation dialogue.

Burden of proof has recently come to be a topic of interest in argumentation systems for artificial intelligence (Prakken and Sartor, 2006, 2007, 2009; Gordon and Walton, 2007, 2009), but so far the main work on the subject seems to be in that type of dialogue which has most intensively been investigated generally, namely persuasion dialogue. The most significant exception is probably deliberation dialogue, where some recent work has begun to tentatively investigate burden of proof in that setting. This paper has surveyed work on burden of proof in the literature on artificial intelligence and argumentation, and offered

some thoughts on how this work might be extended to the other types of dialogue recognized by Walton and Krabbe (1995) that so far do not appear to have been much investigated in this regard.

Upshur and Colak (2003) studied how research evidence, values and professional experience function in carrying probative weight in evidence-based decision-making in medical contexts. On their account, the usefulness of the new dialectic is that by directing attention to the type of dialogue in question, it establishes how the need for evidence is relative to a particular context of application. A consequence of this approach is that there is no invariant hierarchy of evidence that can be applied to every medical context of argumentation (Upshur and Colak, 2003, 294). This aspect of the work surveyed in this paper has shown how standards of proof represent a key tool for understanding how the context of an argument influences its evaluation in the field of medicine (Upshur and Colak, 2003, 90).

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REFERENCES

- Aristotle (1928). *On Sophistical Refutations*. Cambridge: Harvard University Press.
- Aristotle (1984). *Posterior Analytics, The Complete Works of Aristotle*, vol. 1. ed. J. Barnes, Princeton: Princeton University Press.

- Atkinson, K., Bench-Capon, T. J. M. and Walton, D. (2103), Distinctive Features of Persuasion and Deliberation Dialogues, *Argument and Computation*, 4(2), 105-127.
- Black, E. and Hunter, A. (2007). A Generative Inquiry Dialogue System. *Sixth International Joint Conference on Autonomous Agents and Multi-agent Systems*, 1010-1017.
- Black, E. and Hunter, A. (2009). An Inquiry Dialogue System, *Autonomous Agent and Multi-Agent Systems* 19, 173–209.
- Blair, J. A. and Johnson, R. (1987). Argumentation as Dialectical, *Argumentation*, 1(1), 41-56.
- Bolton, R. (1999). The Epistemological Basis of Aristotelian Dialectic, *From Puzzles to Principles: Essays on Aristotle's Dialectic*, ed. May Sim. Lanham: Lexington Books, 185-236.
- Doutre, S., McBurney, P., Wooldridge, M. and Barden, W. (2006). Information-seeking Agent Dialogs with Permissions and Arguments, *Fifth International Joint Conference on Autonomous Agents and Multiagent Systems*. Technical Report: www.csc.liv.ac.uk/research/techreports/tr2005/ulcs-05-010.pdf
- Dufour, M. (2014). Dialectic and Eristic, ISSA Proceedings 2014. <http://rozenbergquarterly.com/issa-proceedings-2014-dialectic-and-eristic/?print=print>
- Dunne, P. E., Doutre, S. and Bench-Capon, T. J. M. (2005). Discovering Inconsistency through Examination Dialogues. In: *Proceedings IJCAI-05* (International Joint Conferences on Artificial Intelligence), Edinburgh, pp. 1560–1561.
- Gordon, T. F. Prakken, H. and Walton, D. (2007). The Carneades Model of Argument and Burden of Proof, *Artificial Intelligence*, 171, 875-896.
- Gordon, T. F. and Walton, D. (2009). Proof Burdens and Standards, *Argumentation in Artificial Intelligence*, ed. I. Rahwan and G. Simari, Dordrecht: Springer.
- Hamblin, C. L. (1970). *Fallacies*. London: Methuen.

- Johnson, R. (2003). The Dialectical Tier Revisited. In *Anyone Who Has a View: Theoretical Contributions to the Study of Argumentation*, Eds. van Eemeren, F.H., Blair, J.A., Willard, C.A. and Snoeck Henkemans, F.A. Dordrecht: Kluwer, 41-53.
- Lamiani, G., Bigi, S., Mancuso, M., Coppola, A. and Vegni, E. (2017). Applying a Deliberation Model to the Analysis of Consultations in Hemophilia: Implications for Doctor-patient Communication, *Patient Education and Counseling*, 120 (17), 690-695.
- Macagno, F. and Bigi, S. (2017). Analyzing the Pragmatic Structure of Dialogues, *Discourse Studies*, 19(2), 148-168.
- McBurney, P. and Parsons, S. (2001). Chance Discovery Using Dialectical Argumentation. *New Frontiers in Artificial Intelligence*, ed. T. Terano, T. Nishida, A. Namatame, S. Tsumoto, Y. Ohsawa and T. Washio (*Lecture Notes in Artificial Intelligence*, vol. 2253), Berlin, Springer Verlag, 414-424.
- McBurney, P. Hitchcock, D. and Parsons, S. (2007). The Eightfold Way of Deliberation Dialogue, *International Journal of Intelligent Systems*, 22, 95-132.
- Parsons, S. and Jennings N. (1997). Negotiation through Argumentation: A Preliminary Report. *Proceedings of the Second International Conference on Multi-Agent Systems*, ed. Mario Tokoro. Menlo Park, California: AAAI Press, 267-274.
- Prakken, H. (2006). Formal Systems for Persuasion Dialogue. *The Knowledge Engineering Review*, 21, 163-188.
- Prakken, H. and Sartor, G. (2006). Presumptions and Burdens of Proof, *Legal Knowledge and Information Systems: JURIX 2006: The Nineteenth Annual Conference*, ed. T. M. van Engers, Amsterdam: IOS Press, 21-30.
- Prakken, H. and Sartor, G. (2007). Formalising Arguments about the Burden of Persuasion. *Proceedings of the Eleventh International Conference on Artificial Intelligence and Law*. New York: ACM Press, 97-106.

- Prakken, H. and Sartor, G. (2009). A Logical Analysis of Burdens of Proof. *Legal Evidence and Proof*, ed. Hendrik Kaptein, Henry Prakken and Bart Verheij. Farnham: Ashgate, 223- 253.
- Rapanta, C., Garcia-Mila, M., & Gilabert, S. (2013). What is Meant by Argumentative Competence? An Integrative Review of Methods of Analysis and Assessment in Education. *Review of Educational Research*, 83(4), 483–520.
- Schiappa, E. (1999). *The Beginnings of Rhetorical Theory in Classical Greece*. New Haven and London: Yale University Press.
- Upshur, R. E. G. and Colak, E. (2003). Argumentation and Evidence, *Theoretical Medicine*, 24, 283 – 299.
- van Eemeren, F. H. and Grootendorst, R. (1992). *Argumentation, Communication and Fallacies*. Hillsdale, New Jersey: Lawrence Erlbaum Associates.
- van Laar, J., (2010). Argumentative Bluff in Eristic Discussion: An Analysis and Evaluation, *Argumentation*, 24(3), 383-398.
- van Laar, J. A. and Krabbe, E. C. W. (2010). Examining the Examination Dialogue. In *Dialectics, Dialogue and Argumentation*, ed. C. Reed and C. W. Tindale. London: College Books, 31-44.
- Walton, D. (1998). *The New Dialectic: Conversational Contexts of Argument*. Toronto: University of Toronto Press.
- Walton, D. (2006). Examination Dialogue: An Argumentation Framework for Critically Questioning an Expert Opinion, *Journal of Pragmatics*, 38(5), 2006, 745-777.
- Walton, D. (2008). *Witness Testimony Evidence: Argumentation, Artificial Intelligence and Law*. Cambridge: Cambridge University Press, 2008.
- Walton, D. (2010). Burden of Proof in Deliberation Dialogs, *Proceedings of ArgMAS 2009*, ed. P. McBurney et al., Lecture Notes in Computer Science 6057, Heidelberg, Springer, 2010, 1-22.
- Walton, D. (2014). *Burden of Proof, Presumption and Argumentation*. Cambridge: Cambridge Press.
- Walton, D. Atkinson, K. Bench-Capon, T. J. M. Wyner, A. and Cartwright, D. (2010). Argumentation in the Framework of

- Deliberation Dialogue, *Arguing Global Governance*, ed. Bjola, C. and Kornprobst, M. London: Routledge, 210-230.
- Walton, D. and Krabbe, E. C. W (1995). *Commitment in Dialogue*. Albany: SUNY Press.
- Walton, D., Toniolo, A. and Norman, T. J. (2014). Missing Phases of Deliberation Dialogue for Real Applications, *Proceedings of the 11th International Workshop on Argumentation in Multi-Agent Systems*. [http://www.dougwalton.ca/papers in pdf/14ArgMAS.pdf](http://www.dougwalton.ca/papers%20in%20pdf/14ArgMAS.pdf)
- Walton, D., Toniolo, A. and Norman, T. J. (2016). Speech Acts and Burden of Proof in Computational Models of Deliberation Dialogue. *Proceedings of the First European Conference on Argumentation*, ed. D. Mohammed and M. Lewinski. London: College Publications, 757-776. [http://www.dougwalton.ca/papers in pdf/16ECAfinal.pdf](http://www.dougwalton.ca/papers%20in%20pdf/16ECAfinal.pdf)