COMPUTATIONAL DIALECTIC AND RHETORICAL INVENTION

This paper has three dimensions, historical, theoretical and social. The historical dimension is to show how the Ciceronian system of dialectical argumentation served as a precursor to recent computational models like the Carneades argumentation model. The theoretical dimension is to show concretely how these models reveal the interdependency of rhetoric and logic, and so the interdependency of the normative with the empirical. The paper brings this out by identifying points of disagreement in a dialectical format through using argumentation schemes with matching critical questions. The social dimension is to show how the Ciceronian dialectical viewpoint integrates with the use of these computational tools to support the principle of reason-based deliberation that is fundamental to deliberative democracy.

Logic and rhetoric are fields that, while traditionally far apart, are in a process of rapidly moving toward each other in recent years (Tindale, 1999). With the advent of informal logic and argumentation theory, logic has significantly moved towards becoming a more practical subject (Johnson, 2000). To supplement formal logic, new work on informal fallacies, argument diagramming, and other applied topics, logic has gone beyond the study of abstract deductive forms of argument. Computing, especially in artificial intelligence and multi-agent systems has moved away from exclusive use of deductive logic and inductive reasoning, and has now accepted argumentation as a method of modeling defeasible reasoning (Reed and Norman, 2003). Computational dialectic (Gordon, 1996) is a field in artificial intelligence that uses computer systems to study group environments in which agents convince or persuade each other in a discussion. Models of argumentation that are dialectical, meaning they take pro and con arguments into account, have now been widely established, and many applications of them to computing are being developed (Besnard, Doutre and Hunter, 2008, v).

Argumentation schemes (Walton, Reed and Macagno, 2008) are being widely applied in artificial intelligence and law (Prakken and Sartor, 1996; Verheij, 2003). Following the lead of the new rhetoric of Perelman and Olbrechts-Tyteca (1969), the rhetorical study of everyday forms of argumentation has transformed the traditional Aristotelian "topics" (Kienpointner, 1993). Cicero proposed using topics, forms of argument that have an important heuristic function, for argument invention (Leff, 1996), nowadays associated with argumentation schemes. Such schemes have been put forward as a helpful way of characterizing structures of human reasoning, like argument from expert opinion, that have proved troublesome to view deductively. The fields of informal logic and rhetoric are moving towards a common basis in pragmatics (Dascal and Gross, 1999). Informal logic studies the uses of defeasible argumentation in contexts of use. The rapidly continuing evolution of these fields raises many controversial questions about how they are related, and also many general interdisciplinary concerns. How do rhetoric and logic fit together as fields? Is it possible, despite the history of their often bitterly adversarial relationship, there is some better way that the two fields could work together in a constructive way that could strengthen both and make each more useful?

In this paper it is shown how resources from computational dialectic, including the Carneades system (Gordon and Walton, 2006; Gordon, Prakken and Walton, 2007; Scheuer et al., 2010) offer the elements needed to fit logic and rhetoric together into a Ciceronian perspective. It is shown how the Carneades system postulates a nine-step argumentation methodology that reconfigures the traditional relationship between logic and rhetoric. Named after the Greek philosopher, Carneades has three layers: rhetorical, dialectical and logical. In this paper the three layers are shown to fit together in a Ciceronian perspective, providing an approach that offers a

way of overcoming the longstanding adversarial relationship between the disciplines of logic and rhetoric. In this paper, it is shown how two theories, called the empirical persuasion theory and the resemblance theory, need to be compared as ways of explaining the relationship of logic to rhetoric, and how the resemblance theory fits better with the Ciceronian approach. This approach reveals the powerful capabilities of influence of these computational models to conduct political affairs through rhetorical persuasion as an alternative to violence.

1. The Traditional Relationship between Logic and Rhetoric

Why has there been such a strong opposition, even hostility, between rhetoric and logic for so long? To answer this question, it is necessary to go back to consider the ancient Greek roots of both subjects. Plato was hostile to rhetoric, and saw philosophy as a kind of defense against it. Socrates, in the Platonic dialogues condemned the Sophists as motivated by financial gain, and as having no regard for the truth of a matter. The mutual antagonism between rhetoric and dialectic is visible in many places in the Platonic dialogues, as noted by Krabbe (2000, 206). In the *Georgias* (463a – 463d), Socrates denounces rhetoric as a kind of "flattery" (*kolakeia*) and uses the word "semblance" (*eidolon*) in describing its part in politics. Later in the *Georgias* (485a – 485e), Callicles described philosophy (presumably including dialectic) as a ridiculous pastime for grown-ups. But there is another significant historical factor in the Greek roots of both subjects that made this opposition into a wedge that further divided them.

There is also a tradition of mutual antagonism between rhetoric and what was then called dialectic, the ancient counterpart to informal logic. It is not too easy to define 'dialectic' because the term goes back to ancient Greek philosophy (Robinson, 1962), and it has been used in different ways since then. One of the aims of this paper is to give a meaning to it that is currently evolving in studies on argumentation and computing. In this sense, it refers to examining and weighing the arguments on both sides of a contested issue to judge which argument is stronger.

Aristotle defined the term, but it is not very easy to express in any simple formula to the modern reader what Aristotle meant by 'dialectic'. The concept of Aristotelian dialectic does not describe some method of proving a conclusion that would be immediately familiar in the modern context. In *On Sophistical Refutations* (165a40 - 165b12) he classified four types of arguments: didactic arguments, dialectical arguments, examination arguments, and contentious (eristic) arguments. A main characteristic of dialectical argument (*Topics* 100a18 – 100a24) is that it is based on reasoning from acceptable premises (*endoxa*, or reputable statements that commend themselves to the majority or the wise). Broadly speaking, what Aristotle had in mind is that dialectic is a kind of argumentative conversational exchange between two parties who argue for opposed sides of a controversial issue (Krabbe, 2000, p. 208).

Many treatises on games of dialectic were written in the Middle Ages that were supposed to represent disputation in a stylized and structured fashion stemming from the tradition of Aristotle's *Topics*. In a typical dialectical game of this sort, one side in the disputation begins by advancing a proposition that he is obliged to defend. The second party then proposes a number of propositions, one at a time, which the first party must accept, reject, or classify as doubtful (Hamblin, 1970). The second party uses the sequence of questions to try to get the first party to contradict himself, while the second party tries to answer the questions while avoiding contradiction.

The problem is that 'dialectic' is often used as a proxy for 'logic' when discussing the opposition between rhetoric, on the one side, and dialectic or logic, on the other side. We could

say that logic, or logical reasoning has to do with the drawing of inferences from statements to statements, while dialectic has to do with the use of logical reasoning on two opposed sides of a disputed issue. Dialectic can be seen as a special branch of logic that applies logical reasoning to real examples of arguments used in discourse in different contexts of use, like legal argumentation and political debate. However, to place these definitions in context, the reader might want to consult (Hamblin, 1970) and (Walton and Krabbe, 1995). Also, as will be shown below, the term 'dialectic' is now being used in computing in a technical sense that can be defined even more precisely.

Hohmann (2000) cites the trouble between rhetoric and dialectic as arising from the tradition that rhetoric is subordinate to dialectic. The trouble started (Hohmann, 2000, p. 223) with Aristotle's way of drawing the distinction between rhetoric and dialectic in the *Rhetoric* (1355b). The implication of this way of drawing the distinction, according to Hohmann (p. 223) is "to conceive of dialectic as a rather pure and theoretically sound method aimed at a cooperative search for cognitive truth." In contrast, rhetoric is seen as "a seriously tainted and practically compromised knack serving a competitive quest for persuasive success."

Opposition on both sides has continued to the present day. The typical criticism of the one field by the other takes the following form. The philosopher (logician) says that rhetoricians are just "spin doctors" who engage in public relations and advertising for profit, and who have no regard for finding the truth or avoiding fallacious arguments. It might be added that they are only interested in persuasion that is psychologically effective on an audience, and not in objective standards that can be used to judge whether an argument presents evidence in support of its conclusion. The practitioner of rhetoric (in the field of speech communication) says that philosophers do not collect empirical data, and consequently their discipline is so abstract and impractical that it is useless as a scientific field of any importance. It might be added that mathematical logic is useless to evaluate realistic argumentation, and therefore logic is useless to teach people how to construct better arguments, to persuade any real audience, or move them to action. All of us who are working in either field have heard these same arguments repeated over and over, since we were undergraduates. These negative views seem to have trickled down into public opinion as well. Neither field is held in high esteem. Not much seems to have changed in this regard since the time of Richard Whately. Whatley wrote in his *Elements of Rhetoric* (1863, Preface, p. 1): "The subject [rhetoric] stands perhaps but a few degrees above Logic in popular estimation; the one being generally regarded by the vulgar as the Art of bewildering the learned by frivolous subtleties; the other, that of deluding the multitude by specious falsehood." This description of the public status of rhetoric and logic as fields is still fairly apt.

This opposition is unfortunate, because with the advent of new methods used in argumentation theory and computing, there seems to be an expanding common ground between logic and rhetoric, and better possibilities for collaboration between the two fields. These possibilities were opened up by the work of Perelman and Olbrechts-Tyteca (1969) whose new rhetoric combined a new practical approach to the normative study of argumentation with a reversion to the Aristotelian view that rhetoric has a basic normative or logical component. The new rhetoric seemed radical at the time, and still does to many, because of the way both logic and rhetoric had developed as fields prior to this time. In the nineteenth century, rhetoric centered on the use of style and expression in a speech, in a way that made the logical structure of argumentation in persuasive discourse seem unimportant. In the twentieth century, communication studies moved to a dominant social science model, in which the collection and (mainly statistical) analysis of empirical data is the central, or the only serious scientific work to

be done. At the beginning of the twentieth century, deductive logic flowered as a scientific and mathematical discipline. The old concern with everyday practical argumentation, including the study of fallacies, definitions and so forth, lingered on in the logic textbooks only in variants of its old Aristotelian form, undeveloped, and largely ignored as a subject worthy of serious investigation. These two conventional streams of thought hardened the ancient opposition between logic and rhetoric, cementing mutual distrust.

The practical analysis and evaluation of argumentation in natural language texts of discourse has, in the past, fallen into the gap between two traditional fields – logic and rhetoric. Logic has been, for the most part, an abstract subject, not very well suited to dealing with many parameters of argumentation in natural language. Logic has been useful, mainly for identifying certain deductive forms of argument, and inductive variants, and for studying their formal properties. But such techniques have proved to be of limited use for practical purposes of identifying, analyzing and evaluating cases of everyday argumentation. The lack of any systematic framework for dealing with informal fallacies, enthymemes, abductive arguments, ambiguity, burden of proof, use of definitions in arguments, and many other common phenomena of argumentation, has limited the practical usefulness of logic as an applied discipline (Hamblin, 1970).

Rhetoric, on the other hand, centers on effectiveness – the psychological persuasiveness of an argument on an audience – and is therefore not primarily meant to be a method of judging whether the argument is logically correct or fallacious (Tindale, 1999). Logic has claimed the area of informal fallacies, and other practical pursuits like argument diagramming (although too often without making any serious effort to study such matters). Advocates of the new rhetoric, who feel that their work is not just restricted to the psychological effectiveness of argumentation, have investigated normative aspects of argumentation (Perelman and Olbrechts-Tyteca, 1969). In the main however, there has been a sharp divide between formal logic and traditional rhetoric, and the practical problems of the analysis and evaluation of everyday argumentation have fallen into the gap between them.

Recent interdisciplinary work in argumentation and informal logic has now started to fill that gap (van Eemeren, Grootendorst, et al., 1996). But it is unclear whether this kind of work can lay claim to any status as a distinct field in its own right, based on a systematic structure and a set of methods. More and more, however, the term ‘dialectical’ is being used to characterize the kind of structure and methods in use in this area. This term implies that an argument is no longer being viewed as just a “designated” set of propositions. It is being viewed as a goal-directed move made at a particular stage in a conversation between two parties who are collaborating by following conversational rules that govern each move. This notion of conversational maxims being used to identify and analyze inferences that are drawn by suggestion (implicature) was introduced by Grice (1975). It fits with a renewal of a very old field that had languished in obscurity for two millennia, namely dialectic. The term was well known to Plato and Aristotle as the art of argument in a collaborative conversation in which two speech partners try to reason with each other for some collective purpose. But with the advent of deductive logic, the old dialectic fell into obscurity. Even worse, “dialectic” was taken over by Hegel and Marx, who used the term in a very different way, much at odds with its Greek origins. Only with the advent of Grice’s prophetic remarks on the logic of conversation (1975) was a way of reviving the old dialectic made possible. Now recent work in argumentation theory has led to the development of a new dialectic, or dialogue-based approach to argumentation (Hamblin, 1971; Rescher, 1977; Mackenzie, 1981; Hintikka, 1979; Barth and Krabbe, 1982; Walton and Krabbe, 1995; Walton,

1998). This new dialectic has gone beyond Grice by classifying and formalizing different types of conversations, even building precise structures of formal dialectic to model different types of goal-directed dialogues.

2. The Ciceronian View

Traditionally, rhetoric and logic have been sharply separated as subjects (except in certain authors, like Aristotle, where there was held to be a close connection). The reasons for this separation are not hard to understand, historically. Logic, after the advent of Aristotle's syllogistic, concentrated largely on deductive and inductive inference, leaving the area of informal logic and informal fallacies in a small pigeonholed corner of the textbooks, where it was not advanced in any significant way. On the other hand, deductive logic underwent a mathematical transformation at the beginning of the twentieth century that made it into an exact scientific discipline. At the same time, rhetoric in the nineteenth century was seen as a more literary discipline that concentrated on matters of style and delivery. The two subjects seemed to develop in quite different directions, and to have little in common. However, with the advent of argumentation methods and their applications to artificial intelligence, a new subject has entered called computational dialectic (see section 3). As we will see, there are definite and interesting parallels between the Aristotelian notion of dialectic and the recent revival of informal logic. These developments require a reframing of the issue, since dialectic is the branch of logic most closely connected to rhetoric and public persuasion. Cicero, a lawyer and politician as well as a writer on philosophy and rhetoric, built on this Greek tradition of dialectical argumentation.

The central goal of Cicero's work was to unify philosophy and rhetoric, shown by both his philosophical writings and his life as a lawyer and political leader. In particular, the Hellenistic philosophy that Cicero adopted and took as his methodology was the fallibilism of the Greek skepics, which he learned from Philo of Larissa and other scholars of the Third Academy, especially Carneades. Carneades was the head of the third Platonic Academy that flourished in the second century B.C. He is best known for his fallibilist theory of defeasible reasoning, but he also had reputation in his lifetime as a master rhetorician. Cicero took the Academic method of the Third Academy as a dialectical procedure that argues for and against two competing views to reveal which one is the most likely to be true (Thorsrud, 2002, 4). The so-called skeptics of the Third Academy had inherited the Socratic method of argumentation that tests arguments on both sides of a disputed issue by weighing the argumentation on one side against that of the other side when each is subjected to probing critical questioning by the other side. Cicero's major works present a vision of the philosopher conducting political affairs through the combined use of dialectical argumentation and rhetorical persuasion as an alternative to violence (Mitsis, 1999, 143). There was a continuing stream of thought that started with Plato (or Socrates), and went through the Third Academy to Cicero. It adopted a particular methodology, associated now with the argumentation approach, that fits logic (dialectic) and rhetoric together, showing how each needs the other.

Rhetoric, on this view, can be seen as having the central aim of improvement of advocacy skills. The new dialectic takes as a primary model of argumentation the critical discussion, in which there are two parties, and the goal of each is to present the strongest and most persuasive arguments to support its viewpoint or claim, as conclusion. In order for a critical discussion to be successful, each party must present strong and compelling arguments, and also probingly criticize and test out the claims of the other side by using counter-argumentation. What does each

side need for this purpose? The answer is that they need excellence of rhetorical skills. They need strong arguments that are persuasive as directed to the given audience. These arguments do not need be logically perfect, because they can be tested out in the critical discussion. The real goal of such a dialogue should be to improve the arguments on both sides, and to clarify the positions (commitments) on both sides by logically probing into them, and even by finding fallacies and contradictions in them (Walton and Krabbe, 1995). Use of this technique is the dialectical skill attributed to Socrates, developed further by the Third Academy, and built into a workable system of argument invention by Cicero.

Cicero built a system of rhetorical invention in *De Inventione* using a method built on the use of logical reasoning used to make arguments for and against a contested claim (Leff, 1983). Cicero's system of rhetorical invention was also derived from a handbook now lost (Kennedy, 1963, p. 303), written by Hermagoras of Temnos, a second century B.C. rhetorician. The system emphasized the use of logical reasoning for the purpose of presenting and attacking arguments used to argue on both sides of a claim. The motivating idea in the widely known *stasis* argumentation structure of Hermagoras was that the argumentation used in a speech must be meant to address some central issue. This issue, called the *stasis*, in Greek, or *status*, in Latin, is made up of two opposed claims representing a conflict of opinions. The goal of relevant argumentation used in a case is to justify or attack the claim made or attacked both sides. To evaluate the argumentation used in this kind of debate, Cicero used topics, representing different kinds of commonly used arguments, like argument from analogy, that carry weight as evidence in persuading a judge or audience to accept an argument or not. These topics are comparable to what are now called argumentation schemes. In the *De Inventione*, he recognized three elements that are essential to argumentation. The first element is the evidence composed of the facts of the case, which he described as the "narrative of the events that occurred" (I.xix.27). The second element he recognized (after Hermagoras) was the central issue (*stasis*) of the case. The third element was the argumentation used on both sides of the case, composed of different types of arguments fitting argumentation schemes. Much of Cicero's concern in the *De Inventione* was with the different types of arguments, and how each can be used to carry weight (so-called probability, in the sense in which the term was used in the Third Academy) in a dispute (Leff, 1996).

Here we have all the elements needed for a system of argument invention. We have a central claim to be proved or disputed, we have chain of argumentation directed to proving the central claim on one side, and another chain of argumentation directed toward refuting or disputing the claim on the other side. These are all the relevant arguments that need to be summed up and evaluated comparatively to judge which side won the argument at the closing stage of the procedure. However, at the opening stage of the procedure, each side needs to construct arguments that can be used to prove its central claim. They can do this by constructing chains of arguments designed to move forward through the argumentation stage to prove or disprove the central claim at issue. They do this by taking the facts of the case as premises, along with other statements that are acceptable to the audience, and using argumentation schemes, along with their own guesses about which arguments will work, to build a chain of argumentation that will go from these acceptable premises to the ultimate conclusion (claim) at issue. A successful chain of argumentation goes from the accepted premises as start points to the ultimate conclusion as the end point. Rhetorical invention is the art and science of building such an argumentation chain.

On this view, dialectic (logic) is useful for rhetoric, because although arguments to prove a claim are invented partly by experience and intuition, the dialectical method of argument invention, using automated search tools for argument construction like Carneades, can assist this process. This view supports the hypothesis that logic and rhetoric should have much more in common than conventional opinion seems to hold. The new dialectic that has recently emerged from argumentation theory and informal logic, despite differences of emphasis among the various practitioners, has moved towards a position in which the strong opposition between rhetoric and logic has been lessened. A Ciceronian way has been opened for the two fields to be in a position to work together constructively, even though they remain two different fields with differing (although partly overlapping) goals and methods.

3. Argumentation Schemes and Computational Dialectic

The new dialectic developed in (Walton and Krabbe, 1995) and (Walton, 1998) has taken as its central function the identification, analysis and evaluation of arguments as used in different contexts of goal-directed collaborative conversation. In its typical use, dialectic has been applied to a particular argument used in a given case, where the case is represented by a specific text of discourse. The first step is the identification the argument – that is, the premises (both explicit and implicit) and the conclusion. The second step is the analysis of the argument, often very tricky because it involves the interpretation, or even several interpretations, and clarification, of what is presumably being put forward by an arguer in a natural language text of discourse. The text of discourse may be incomplete, vague, ambiguous, and in some cases, intentionally deceptive and misleading. The third step is the evaluation of the argument. Evaluation includes not only deductive validity and inductive strength, but also, much more broadly matters of how the argument is being used for some communicative purpose in a given case. Evaluation includes matters associated with informal fallacies, like dialectical relevance, circularity, appeal to expert opinion, use of personal attack (*ad hominem*) arguments, and many other matters and argumentation schemes associated with the various informal fallacies. Many of these uses of argument, although traditionally categorized as fallacious, can be seen as reasonable, within the framework of the new dialectic. When they are reasonable, they are neither deductively valid nor inductively strong. They are abductive arguments that shift a burden of proof to one side or the other in a dialogue exchange between two parties.

Argumentation schemes appear similar to the forms of arguments we are familiar with in deductive logic, like *modus ponens* or syllogistic argument forms. But the most common ones (a) represent defeasible, plausible arguments that depend on common understanding of the way things can normally be expected to go in a kind of case familiar to speaker and hearer, and (b) depend on warrants that are generalizations that hold only subject to exceptions. The study of such defeasible plausible argumentation schemes has become very important in computer science, and has come to be seen as very important in modeling legal argumentation. It is recognized that they are fundamentally important in the field of informal logic, and that they are the basic building blocks of reasoned argumentation (Walton, Reed and Macagno, 2008). They are also highly significant for coming to understand the proper basis of the relationship between rhetoric and dialectic. These forms of argument are the link that ties dialectic and rhetoric much more closely together than has been appreciated in the past. They indicate that there needs to be a new bond between rhetoric and dialectic that calls for a new way of thinking about both fields.

The key to understanding their relationship is to grasp how argumentation schemes tie persuasive discourse together. In this paper it is shown that advances in the study of schemes (Walton, Reed and Macagno, 2008) have led to a new view of argumentation that makes rhetoric, logic and dialectic fit together in a complementary way.

The argumentation scheme for argument from expert opinion is a good case in point. The scheme for argument from expert opinion (Walton, Macagno and Reed, 2008, 310) is shown below.

MAJOR PREMISE: Source *E* is an expert in subject domain *S* containing proposition *A*.
MINOR PREMISE: *E* asserts that proposition *A* is true (false)
CONCLUSION: *A* is true (false)

This scheme is defeasible, meaning that if the premises are accepted, that gives a reason to accept the conclusion tentatively, but if an appropriate critical question is asked, the argument could be defeated or cast into doubt. There are six basic critical questions matching this scheme.

CQ_1: *Expertise Question*. How credible is *E* as an expert source?
CQ_2: *Field Question*. Is *E* an expert in the field that *A* is in?
CQ_3: *Opinion Question*. What did *E* assert that implies *A*?
CQ_4: *Trustworthiness Question.* Is *E* personally reliable as a source?
CQ_5: *Consistency Question.* Is *A* consistent with what other experts assert?
CQ_6: *Backup Evidence Question.* Is *E*'s assertion based on evidence?

Consider the following example of a typical case of expert testimony in a murder trial. In a murder case, bloodstains found at the crime scene were tested, and the DNA in them was found to match that of the defendant. An expert in forensic medicine, Dr. Blast, testified that the DNA in the bloodstains tested matched that of the defendant.

Dr. Blast's testimony is relevant evidence in the trial, provided he is admitted by the judge as an expert witness. It is relevant because it carries probative weight in relation to the ultimate issue of the trial, namely the issue of whether the defendant committed the crime s/he was charged with.[1] In this case, the ultimate probandum to be proven by the prosecution is the statement E that the defendant committed the murder. The relationship of the other statements in the argument above to E can be shown in the argument diagram in figure 1, drawn with Araucaria (Reed and Rowe, 2005). The argumentation scheme for argument from expert opinion is displayed in figure 1 in the subargument from premises C and D to conclusion B. The chain of argumentation displayed in the diagram shows that C to can be used as evidence to support E in a chain of argumentation. We can use it to show why the bloodstain is relevant. The reason is that it places the defendant at the crime scene around the time the crime was committed, and shows he shed some blood there. One explanation of why the defendant was present and shed some blood there is that he committed the crime. Even a very simple example like this shows how argument can be looked at in two ways. One way is to set out its premises and conclusions and then to analyze and evaluate the argument in order to see whether the premises support the ultimate conclusion at issue. But even the simple example mapped in figure 1 reveals that argumentation schemes have another use. They can be used to build up chains of arguments to

[1] To see how expert opinion testimony is used as a form of argumentation in law, see (Walton, 1997) and (Verheij, 2003).

construct a strategy to prove an ultimate probandum. This task is one of construction of new arguments, often called argument invention.

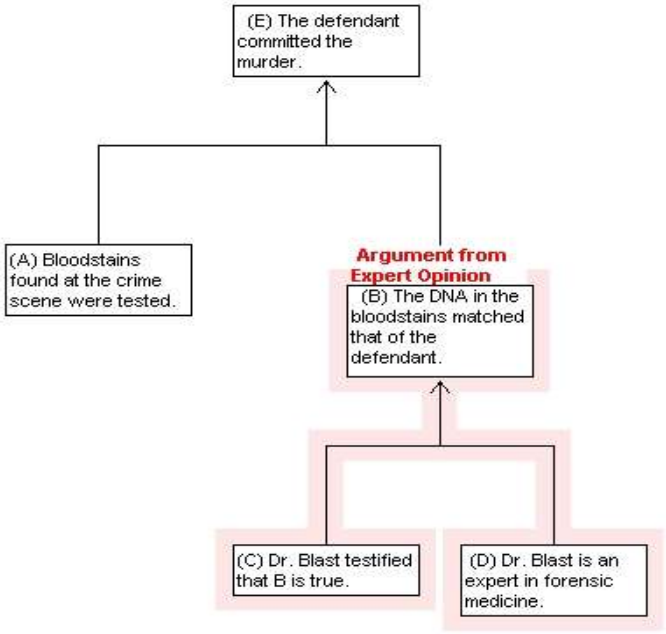

Figure 1: Argument Map of the Dr. Blast Example

What is important to note is that both the dialectical task of evaluating a given argument and the rhetorical task of inventing new arguments designed to prove some statement at issue use argumentation schemes.

As we all know, sophisticated automated techniques of searching for a designated conclusion from a given set of premises in a knowledge base are now widely employed in computing. We can use this technology along with argumentation schemes to chain forward from a given argument to see if it can be extended by other arguments connected to it that enable the chain to reach a designated conclusion. Once the premises and the conclusion of the given argument have been identified, we can apply the search engine, and it will recursively apply all the rules of inference to the premises, chain forward, and either reach the designated conclusion or not. To be of practical use, however, the rules of inference used in the system need to be comprehensive enough to include widely used forms of argument, like argument from expert opinion, argument from analogy, argument from appearance, and argument from witness testimony.

Carneades uses argumentation schemes, and applies them to argument construction (invention) as well as to argument analysis and evaluation. Carneades is a mathematical model consisting of definitions of mathematical structures and functions on these structures (Gordon, Prakken and Walton, 2007). It is also a computational model, meaning that all the functions of the model are computable. Carneades defines mathematical properties of arguments that are used to identify, analyze and visualize real arguments. Carneades models the structure and applicability of arguments, the acceptability of statements, burdens of proof, and proof standards, for example preponderance of the evidence. Carneades has been implemented and can be downloaded here: http://carneades.github.com/.

The original motivation of the Carneades system was to accommodate two different variations on what happens when a respondent asks a critical question (Walton and Gordon, 2005). On the one theory, as indicated above, when a critical question is asked, the burden of proof shifts to the proponent's side to answer it. On the other theory, merely asking the question does not defeat the proponent's argument until the respondent offers some evidence to back it up. Carneades approaches this distinction by distinguishing three types of premises, called ordinary premises, assumptions and exceptions. Ordinary premises behave like assumptions at issue. An assumption holds if it is undisputed or accepted, but not if it is rejected. An undisputed ordinary assumption holds if its statement is acceptable, given its proof standard, or if it has been accepted, but not if it has been rejected. Exceptions hold unless the statement of the exception has been proven acceptable.

The Carneades method of determining the acceptability of an argument can be summarized as follows (Gordon and Walton, 2006).

- At each stage of the argumentation process, an effective method (decision procedure) is used for testing whether some proposition at issue is acceptable given the arguments of the stage and a set of assumptions.
- The assumptions represent undisputed facts, the current consensus of the participants, or the commitments or beliefs of some agent, depending on the task.
- This determination may depend on the proof standard applicable to the proposition at issue, given the dialogue type and its protocol.
- What is used is a decidable acceptability function provided by the Carneades model of argument

This method can be applied to argument reconstruction and argument invention.

Argument reconstruction is an application of abductive reasoning, using the argumentation scheme for abductive reasoning. This scheme and others are used as patterns to construct a set of alternative interpretations of the text. These interpretations form the set of hypotheses for abductive reasoning. The task is then to choose the interpretation among the hypotheses which best explains the text and other contextual evidence. Once the argument has been reconstructed, the scheme can also be used to help identify missing premises. Consider the following text: Markley lives in California and tells me the weather is beautiful there. The scheme for argument from position to know could be used to help interpret the text as the following argument: the weather is good in California since Markley has asserted this and is in a position to know about it.

Argument invention is also a capability of Carneades. Argumentation schemes in the Carneades model can be viewed as heuristic search procedures that apply statements from a data base (e.g. in law it could be a set of statutes or precedents) to find arguments pro or con the claim at issue. The arguments that turn up in the resulting stream are alternative ways that can be used to prove the claim. Requirements can be used to guide the search, for example to prefer arguments with the most acceptable premises. Carneades provides an integrated dialectical framework enabling a variety of legal argumentation schemes, such as arguments from legislation and precedent cases, to be used together in a comprehensive system supporting argument construction, selection and evaluation. Argumentation schemes in this model are interpreted as heuristic search procedures, to be used to help find and construct effective arguments during legal discourse. This contrasts with prior research, which uses argument schemes mainly to identify, analyze and evaluate arguments already present.

In Araucaria, a premise is diagrammed as a statement in a text box, and the role of the premise, like major or minor premise, is displayed in the box, as the example shown in figure 1 illustrates. In the Carneades graphical user interface, a premise is a relation between a statement and an argument, shown as a node in the argument map in figure 2.

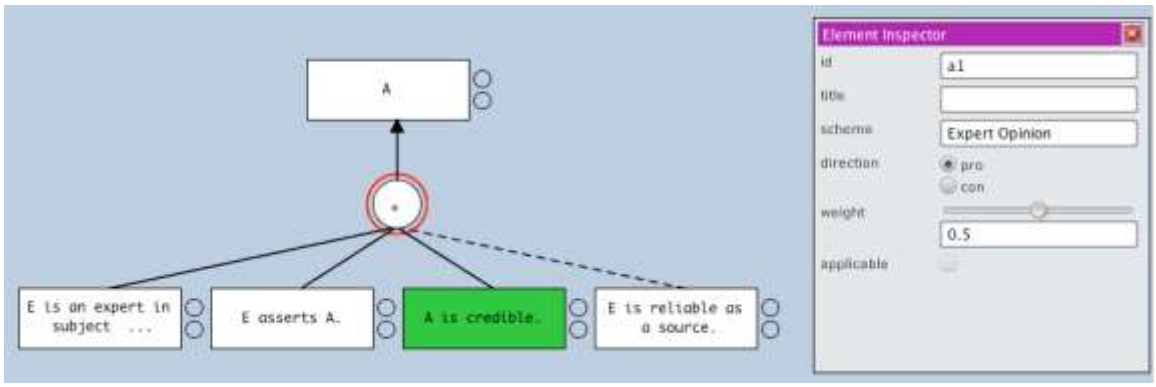

Figure 2: Carneades Graphical User Interface Showing Argument from Expert Opinion

In figure 2, some of the premises for an argument from expert opinion are shown along the bottom. The first two are ordinary premises. The third one (darkened in green) is an assumption. The fourth one (the one on the extreme right) is an exception, indicated by the dotted line leading to the node that is circled in the middle. The Element Inspector menu on the right shows the scheme for Expert Opinion, which is contained in the node in the diagram (where the + symbol) appears.

Carneades has been especially built to model legal argumentation, but Araucaria has also been applied to legal argumentation. There is a key difference between the two argument visualization systems. In Araucaria, each statement can be used as a premise in only one argument. In Carneades, a statement can be used as a premise in any number of arguments. Another visualization tool, Rationale (http://rationale.austhink.com), like Araucaria, was originally designed to work with everyday conversational argumentation, but is now also being applied to legal argumentation.

In addition to argumentation schemes and argument visualization tools, a third initiative that is important for the subject of this paper is the more general research in computing on computational dialectics, a field in which intelligent computer systems are used to mediate dialectical processes between human participants. Such processes include structuring discussions and collective decision-making in deliberations, and monitoring the application of discussion rules.[2] The term was first used and defined use and defined the term in the 1993 thesis of Thomas F. Gordon.[3] Various artificial intelligence conferences have advocated the uses of dialogue theory (such as the new dialectic of Walton, 1998) in computing. One of these conferences even used the expression ‘computational dialectics’ as early as 1994. A workshop

[2] Statement of the Intelligent System Group for Computational Dialectics, accessed Nov. 30, 2009 at: http://www.cs.uu.nl/groups/IS/cd.html

[3] See (Gordon, 1995, xi) for the published version.

organized by Ronald Loui and Thomas F. Gordon, as part of the AAAI-94 Conference in Seattle Washington, was the first event to draw broader, international attention to the subject. The workshop web page may still be found: http://www.cs.wustl.edu/~loui/comectics.text. The workshop description defined 'computational dialectics' as meant to describe "an area of activity in AI, which considers the language and protocol of systems that mediate the flow of messages between agents constructing judgment, agreement, or other social choice, to recognize or achieve an outcome in a fair and effective way." The description tells us that dialectic began with the ancients, and is equated by many with rationality.

4. Fallacies and Argumentation Schemes

Many of the most common forms of argument associated with major fallacies, like argument from expert opinion, *ad hominem* argument, argument from analogy and argument from correlation to cause, have now been analyzed using the device of argumentation schemes (Walton, Reed and Macagno, 2008). Argumentation schemes provide a helpful way of characterizing structures of human reasoning, such as argument from expert opinion, that have proved troublesome to view deductively. The traditional logic textbooks treated these forms of argumentation as informal fallacies, but research informal logic is now supporting the theses that they are not always fallacious, and that they are very useful arguments in many cases (Hansen and Pinto, 1995).

It is characteristic of rhetorical argumentation that the speaker has a message, a particular claim or conclusion that she wants to prove, or to argue for. This same feature is true of dialectical argumentation. For example, in a persuasion dialogue, a participant has a particular proposition designated as her proposition to be proved. Another characteristic of rhetorical argumentation is that the speaker aims her message at a specific audience. This characteristic is also present, to some extent, in all the dialectical frameworks of argumentation. For example, in persuasion dialogue, the proponent, to be successful must base her argumentation on premises that really represent the commitments of the respondent (Walton and Krabbe, 1995). Each participant must direct his or her arguments to the commitments of the other participants, as far as these are known, or have been revealed in the dialogue to its present point. In these salient respects then, the way argumentation is used is very similar. Rhetoric and informal logic also use the same argumentation schemes. These similarities mean that the two subjects are much closer than conventional wisdom seems to suggest. In particular, it suggests that informal logic, although different from rhetoric in its aims can be extremely useful to rhetoric.

The differences between the two subjects, although distinct on the surface, have an underlay of interconnections under the surface. Rhetoric does not have to use arguments that are logically or dialectically correct. But it will generally do much better if it uses arguments that appear to correct. For an audience that is trying to make up its mind about what to do, or what to accept, will generally try to use arguments that do appear to be correct. So that is one important connection between dialectic and rhetoric. Another is that fallacies are not just arguments that are logically incorrect. They are arguments that appear to be correct. Fallacies are erroneous arguments, or deceptive ones used to try to get the best of a speech partner unfairly. In other words, the concept of fallacy does have a psychological or rhetorical element. This element does not require that every fallacious argument has to appear correct to its audience. All it means is that fallacies are connected to kinds of arguments that generally appear to be reasonable, because, in many cases, they are reasonable. They generally appear to be correct, and that is what

makes them deceptive, and potentially useful as tactics of sophistry. In short, the concept of fallacy itself has a rhetorical element. So there is a connection between dialectic and rhetoric through the notion of fallacy. The notion of fallacy is the key to grasping this connection.

Rhetoric uses arguments to persuade a target audience, to negotiate, or to carry out other goals that dialectical argumentation is needed to achieve. It doesn't always need to use arguments that are valid, or structurally correct from a dialectical point of view. But the kinds of arguments that tend to be persuasive are the ones that look like they are reasonable arguments (structurally correct and relevant arguments with acceptable premises) to a target audience. It is very helpful to rhetorical argumentation, therefore, that the arguments it uses look like they are structurally correct and reasonable. Jacobs (2000, p. 273) has made the important point that reflecting on the notion of fallacy leads towards getting a better grasp of what the relationship between dialectic and rhetoric should be. Jacobs noted that although fallacies are argumentative moves that seem good when they are not, people know that they can be tricked or deceived by fallacies. So just because an argument seems reasonable or seems unreasonable, it does not follow that "it is what it seems" (p. 273). It is for this reason that dialectic is useful to rhetoric. For the more you understand about dialectic, and what really makes an argument correct by normative standards appropriate for a dialogue, the easier it is for you to gasp, in outline what a correct argument looks like. Even beyond that, suppose you know something about fallacies, and about how arguments that may seem correct can be flawed, and can even be used as powerfully persuasive deceptions. This dialectical know-how can be useful in rhetoric – not only for making up plausible arguments, but also for detecting the flaws and weaknesses in the arguments of your opponent. But isn't this using of dialectic for rhetorical purposes very worrisome? Doesn't it raise worries about the possibilities of using propaganda and techniques for the manipulation of public opinion to serve "special interests"?

It is the abuse of this potential usefulness of dialectic for rhetoric that the ancients were so afraid of when they worried about anti-logic and sophistry. Since the time of Plato, philosophers have been worried about the potential for misuse of such a powerful subject (Robinson, 1953). Couldn't such a skill be misused, to make the stronger argument appear to be the weaker, and vice versa? The answer is plainly – yes. The problem of having no regard for the truth of the matter in a discussion goes well beyond the Sophists where, for example, conviction politics is concerned with winning an argument or convincing an electorate rather than searching for truth.

Aristotle defined the art of rhetoric (*Rhetoric* 1355b26 – 1355b27) as "the faculty of discovering the possible means of persuasion in reference to any subject whatever." It is also interesting to note (Aristotle, *Rhetoric* 1355a – 1355a31), that since it can be used to argue for both sides of an issue, it can be misused. The reason is that it possible to argue for the wrong side of an issue. It is quite clear in many passages in the later parts of the *Rhetoric* that Aristotle equated fallacies with sophistical enthymemes. This usage is resonant with implications for the modern study of fallacies in argumentation theory. Fallacies are arguments that typically fall under some argumentation scheme but that are somehow used wrongly, often deceptively, in a give case. Thus a fallacy is effectively persuasive because it looks right. It has the surface appearance of a reasonable argument. The fallacies themselves, and our realization of how common they are, reveal the scope of such a potential for misuse of dialectic. The ancient dialecticians were quite right to worry about it.

The problem with anything useful is that as soon as people learn how to use it, they are tempted to use it in some questionable way – for example, to make profits out of something that might not be to the benefit of the majority. It is like a new weapon. Sooner or later, it will get

used. So as dialectic is taken seriously, and studied as a scientific subject for research, its techniques will become more powerful when used to assist with rhetoric. Unfortunately, that outcome is inevitable. And in fact, many are already making lots of money in the business of public relations, using argumentation techniques, even if it is an unstructured and undeveloped way. There is not much anyone can do about such practices. The only way that the individual citizen can protect him or herself from these abuses is to learn something about dialectic.

It is for all these very substantive reasons that logicians are cautious about any possible connection with rhetoric. But with the advent of the new dialectic, and the possibility of being able to judge whether many common types of arguments are fallacious or not, as used in particular cases of argumentation in everyday speech practices, the potential for useful application of logic is also considerable. Rhetoric and dialectic now fit together. The new dialectical rhetoric, as it might be called, has the power to utilize argumentation to persuade an audience or speech partner, based on the situational specifics of what that audience or speech partner can be presumed to accept in a given conversational setting. The new dialectic gives that audience or speech partner the ability to critically analyze and evaluate such persuasion attempts, and to detect the missing assumptions and fallacies in them. The one skill both counterbalances the other and supports the other.

Cicero's approach to public discourse was based on earlier Greek skepticism that attacked the dogmatic views of earlier philosophers who claimed that humans can have knowledge of truth and reality. The Stoics, for example, claimed that a clear perception of an external object reveals a true impression of what it is like. Skeptics like Carneades took the view that we can be mistaken about sources of knowledge like perception, and therefore need to adopt a dialectical approach that requires considering the evidence on both sides as the basis for drawing a conclusion on what to accept. Based on their views, Cicero took the general approach that although truth is important to guide inquiry, we cannot know truth without the possibility of error, and that therefore we should regard reasoning used in the conduct of everyday life and in political deliberation as defeasible, subject to correction. As Groarke (1990, 153) noted, however, skepticism has often been misunderstood and dismissed because Western philosophy has glorified the use of deductive and inductive reasoning in science and philosophy, and dismissed skepticism because it appears to attack these ideals. The Ciceronian approach was not given the respect it deserved, nor were its social implications recognized or taken seriously.

On the other side, recent critics of the limitations of traditional absolutistic scientific and philosophical theories, like Stephen Toulmin, have argued that fallibilism of the dialectical kind, that sees argumentation as based on defeasible reasoning, is a more modest and practical view. This approach allows us to retain ordinary standards of belief, and apply standards of evidence and reasoning, while retaining the reservations that they may be mistaken, and that we cannot know ultimate reality (Groarke, 1990, 153). This approach also has social implications on how we should conduct the practical affairs of life in matters of ethical and political decision-making. It means that decision-making in practical affairs should be seen as inherently susceptible to critical questioning and intelligent discussion, as opposed to being carried out by interest-based majority vote, or by following claims to scientific knowledge or dogmatic views of religious leaders.

Deliberative democracy rests on the assumption that when a group of people get together and deliberate on what to do in a situation where a political decision is called for, the conclusion they arrive at, if their deliberations are to be useful, should be reason-based. This assumption can be called the principle of reason-based deliberation. It implies that a useful and productive

deliberation weighs the relative merits of the arguments on both sides thoughtfully, and arrives at a conclusion on what choice to make supported by reasoned evaluation of the pro and contra evidence. Through this dialectical process, arguments from expert opinion, arguments from popular opinion, arguments from practical reasoning, arguments from consequences, arguments from positive and negative values, and with them many other defeasible arguments of the kinds used in democratic political rhetoric, can be applied to infer conclusions. In computational dialectics, these arguments can be analyzed and evaluated using argumentation schemes and dialectical factors of the context of use in a dialogue. Such practical arguments can be judged to be reasonable, questionable or erroneous in the context of a deliberation, with regard to how well they contribute to the goal of the deliberation by moving the argumentation forwards towards the goal.

To have real democracy that arrives at decision on what best to do based on evidence and reasoning, voters need to interact with government agencies and officials not only to express their preferences and collect information, but also to engage in argumentation with them about the reliability of the information and about which is the best choice. The problem is how this can be done in a timely way. Computational dialectics has now built working e-democracy systems in the form of groupware tools designed to support structured goal-directed deliberation (Gordon and Richter, 2002). The use of these tools can enhance the quality of the political process by helping to implement the principle of reason-based deliberation. For example, the Parmenides system (Atkinson, Bench-Capon and McBurney, 2006) facilitates democratic argumentation by allowing people to not only get information from government sources, but at the same time gives them a discussion format they can use to critique the government position and propose alternative solutions to the problem at issue. It does this by identifying points of disagreement in a dialectical format through using argumentation schemes and critical questions. The broader social implication is that the Ciceronian dialectical viewpoint integrates with the use of computational tools that can be used to support the principle of reason-based deliberation.

5. Fitting Together of the Dialectic and Rhetoric

Leff (2000, p. 245) has argued convincingly that the issue should not be seen as one of "a contrast between a normative art of dialectic and a merely empirical art of rhetoric." Leff notes (p. 244) that Aristotle did not define rhetoric in terms of persuasive effect. He defined it as the faculty for observing in a given case the available means of persuasion. This definition implies, according to Leff (p. 244), a distinction between using the art of rhetoric properly and achieving a specific outcome. Leff pointed out that, in fact, no matter how well the rhetorician constructs his argument, there is no guarantee that he can succeed in actually persuading a given audience (p. 244). For that is, in any real case, always partly up to the audience. So it won't do to fall back on a simplistic division, by claiming that dialectic is normative and rhetoric is empirical. To get a Ciceronian view, we need to consider two theories about how people reason when they are persuaded by an argument.

According to the first theory, agents tend to be more persuaded by arguments that they think are rational – that is, that are logically strong in presenting good evidence to support the conclusion claimed in the argument. On this theory, agents are sometimes, or perhaps often, persuaded by arguments that are logically weak, or even fallacious. Part of this theory is the following empirical hypothesis about rhetorical persuasion: the closer an actual argument used in a given case appears to be a proper instance of an appropriate argumentation scheme for that

case, and to meet the requirements for that argumentation scheme, the more persuasive is it likely to be. In other words, this theory says that people are generally (though subject to exceptions) more inclined to be convinced by arguments that seem to them to be logically strong, and to meet the logically proper normative requirements for that type of argument used in the given case. Let us call it the resemblance theory. What has been overlooked by the current view of rhetoric as an empirical social science discipline is that rhetoric, to be the most useful subject it can be, needs to have a normative component, as required by the resemblance theory.

The old conventional wisdom about the connection between logic and rhetoric can be expressed in the form of a competing theory called the empirical persuasion theory. It is based on an abductive inference drawn from a premise that states an observed fact. This inference, as stated below, can be called the empirical persuasion inference.

Observed Fact: when an audience is persuaded by an argument, that argument may have been quite effective in persuading that audience, even though the argument is logically weak, erroneous, or even fallacious.
Apparent Explanation of the Observed Fact: logic plays no role in the persuasion of an audience.
Conclusion: all that matters to understand how persuasiveness of argumentation works is to study the empirical effect of the given message on the audience.

The empirical persuasion inference may not often be stated this bluntly, but it is implicit in conventional thinking about persuasive argumentation, and is the basis of the empirical persuasion theory. It fits in with the current view that all that really matters in science, or in any investigation, is the empirical collection of data. It is typical of the kind of thinking in mass persuasion and the psychology of persuasion, and that is strong or even dominant in the field of speech communication. But is the empirical persuasion theory logically reasonable? Some doubts can be raised by considering another inference, one that appears to be opposed to the empirical persuasion inference.

Another inference, called the resemblance inference, is also important for judging the relationship between dialectic and rhetoric. The resemblance inference does not seem to widely held in popular opinion or conventional wisdom. It only has some currency within the field of logic, as a long accepted principle that has never been fully developed or articulated. Within logic, the resemblance inference has some place within the applied part of the discipline associated with the study of fallacies, as shown by the abductive inference that is at the basis of the resemblance inference.

Observed Fact: when an audience is persuaded by an argument, it thinks that argument to make sense – that is to be reasonable, to be logically strong.
Apparent Explanation of the Observed Fact: the audience thinks the argument makes sense either because it is logically strong, or because it resembles an argument that is logically strong.
Conclusion: all that matters to understand how persuasiveness of argumentation works is to study the logical structure of the of the argument used in a case, how the actual argument in the case resembles that form, and how it falls short of the requirements of that form.

The resemblance inference is the basis of the resemblance theory. The resemblance inference is reminiscent of the old doctrine in logic that a fallacy is an argument that seems valid but is not. This doctrine is taken to indicate that the study of fallacies is not a purely formal discipline, in

that it selects out for analysis kinds of argumentation tactics and errors that are powerfully deceptive. They are verbal tricks and traps used to deceive a speech partner in order to unfairly get the best of that speech partner in argumentation. At its basis, this old doctrine can be taken to suggest the resemblance inference.

The empirical persuasion theory and the resemblance theory are opposed to each other in how each attempts to explain how persuasive argument works. The empirical persuasion inference hypothesizes that empirical psychology is the way to explain how persuasion attempts work, and that logic is of no importance or use. The resemblance inference comes at persuasion from the other end. It hypothesizes that dialectic is centrally important in explaining how persuasion attempts work. Logic sets the normative standard, and psychology is only useful to study how an audience is deceived by confusing the reasonable argument (determined by its normative form) with the persuasive argument that resembles it, appearing to an audience to be reasonable.

On the Ciceronian view, dialectic and rhetoric can fit together functionally, each subject enhancing the usefulness of the other. When both subjects are viewed from the Ciceronian perspective, using the resemblance theory to show how rhetoric and dialectic are connected, each field has an important and central function within the other.

6. The New Rhetoric and Informal Logic

Van Eemeren and Houtlosser (2000, p. 296) observed that during the last decades, there has been a remarkable reevaluation of rhetoric: "Most scholars now seem to agree that the division between rhetoric and dialectic is not as sharp as earlier envisaged and that an interest in the use of effective persuasion techniques can very well be reconciled with the maintenance of an ideal of reasonableness of the kind represented by the model of the critical discussion." Van Eemeren and Houtlosser contrast this recent reevaluation with the "sharp and infertile ideological division between rhetoric and dialectic" that has characterized the history of the two subjects. The new view of rhetoric sees it as a subject that is not so centrally concerned with literary style as the subject has been so often seen in the past. Nor does the new view see rhetoric as a mainly empirical subject that is concerned with persuasive effect, judged by audience response. On the new view, rhetoric, like dialectic has argumentation at its core. The core structure of any case studied in rhetoric, on the new view, must always begin by an attempt to determine what the sequence of argumentation is in the case. And then, at the more local level, the structure of each single argument in the sequence needs to be analyzed by determining its argumentation scheme. On the other hand, the new view of rhetoric is not narrowly logical, in that it concentrates only on the form of inference in a given case. What is equally important is how the argumentation is used globally within some context of dialogue. According to the new view then, rhetoric is not just concerned with persuasion, although persuasion dialogue surely must be central. Rhetoric should also be concerned with the uses of argumentation in deliberation, negotiation, and other types of dialog. So construed, the scope of rhetoric is quite broad. It is concerned primarily with argumentation, but also with other kinds of speech acts that often play a role in argumentation, like the asking of a question or the giving of an explanation. And it is concerned with the use of argumentation, and the other kinds of speech acts that accompany it, in the various conversational frameworks cited above. Rhetoric is now seen as a pragmatic subject that is concerned with different kinds of discourse, in which argumentation is used conversationally for some communicative purpose. Of course, the same can now be said of informal logic. So we

come back to the question – what is the defining or essential difference between the two subjects?

The difference between logic and rhetoric stems from how each subject functions in the study of argumentation. An older way of defining this difference turned on the distinction between the invention and warranting functions. But there is a newer way of defining the difference that could be called the backwards and forwards hypothesis. According to this contrastive hypothesis, the difference between dialectic and rhetoric relates to how each is applied to arguments in a given case. Logic has the central aim of examining an argument backwards, or retrospectively. The assumption is that an argument is given, as already have been presented in a given case, and the object of the exercise is to analyze that argument and test it for validity, or evaluate it by other standards of structural correctness. With rhetoric, it is the other way around. The typical assumption is that the speaker is in the middle of a given case. He has a conclusion to be proved, or that he wants to persuade his audience to come to accept. He has just started to argue his case, but he probably already knows or assumes quite bit about what his audience thinks, or is prepared to accept at this point. So the situation is dynamic and fluid. The problem is to try to see where the line of argument should go from here, the mid-point of a dispute, so it will move towards the point where the audience comes to accept the speaker's conclusion he wants to prove. In regard to this central and typical aim, logic tends to be backwards looking while rhetoric tends to be forwards looking. As Farrell (1993, p. 34) observed, "dialectic tends to be more powerful as a retrospective critical system than as a prospective guide to action." In contrast, rhetoric tends to be most powerful as a prospective guide to action.

The Carneades methodology for reconstructing and evaluating arguments (Gordon and Walton, 2010) incorporates the Ciceronian approach by reconciling the two tasks of argument construction and argument evaluation. This methodology can be summarized as a series of nine steps. First, the user makes a list, called a key list, of all the statements explicitly expressed in the text of the argument. Second, the user identifies the premises and conclusion of each argument, where each premise and conclusion is a statement in the key list. Third, the user chains together the arguments so that the conclusion of one argument may also act as the premise of another. Fourth, the user creates an argument map, a diagram that links the statements together into a sequence of reasoning. Fifth, the user labels each argument with an argumentation scheme. Sixth, the user labels the statements that have been accepted as true or rejected as false. Seventh, in a procedure performed automatically by the Carneades software, the system uses the arguments to reason forward from the accepted and rejected statements and the argumentation schemes that are applicable. Eighth, the system assigns proof standards, like preponderance of evidence, that apply to each statement in the graph of the argument. Ninth, the system critically evaluates the arguments by checking to see which conclusions are acceptable, and uses the argumentation schemes to reveal implicit premises. The most general application of the system falls under the heading of dialectic, because the task undertaken is the evaluation of an argument that is already given in the text of some example. However, notice that step seven undertakes the task of argument construction. The question is therefore raised what parts of the tasks undertaken by Carneades fall under the heading of rhetoric as opposed to dialectic.

The answer (Gordon and Walton, 2010) is that even though Carneades can applied to many different kinds of tasks concerning the identification, analysis and evaluation of argumentation, in general there are three layers concerning such argumentation use cases. At the top is the layer where a participant in argumentation selects the appropriate move, presents his argument, possibly also visualizes it as an argument map, and decides on issues. In the middle is the

dialectical layer where arguments are reconstructed, and where dialogue protocols are applied to manage commitments and see that the argumentation moves follow the procedural rules. At the bottom level there is a logical layer where arguments are constructed by applying argumentation schemes, and where knowledge is managed. We can see from this three-layered specification of use cases that argument construction mainly takes place within the logical layer, and then carried forward into the rhetorical layer. We can observe that the rhetorical layer builds on both the logical layer and the dialectical layer. On this model, it is made clear how dialectic and rhetoric are functionally connected, and how both are connected to logic, in carrying out tasks of both constructing and evaluating arguments.

7. Conclusions

In rhetoric of this Ciceronian sort, on the Carneades model, a speaker can get logical help in searching for the right arguments that will be useful in successfully getting the audience to come to accept his contention. Computational dialectic provides the tools of automated argument construction to find such arguments, based on the ultimate claim to be proved and the evidence one has. This process of argument construction has been automated in Carneades using argumentation schemes. Such an automated system of argument construction is meant to help a human rhetorical arguer choose from the available arguments and select the best one. This argument can then be expressed in a stylistically appropriate manner in a persuasive message.

The difference between rhetoric and dialectic, on the Ciceronian view, resides in how each subject is typically used to apply to a particular case or problem. One task of rhetoric is the forward-looking process of searching around for just the right argument that is useful at some particular juncture in the use of argumentation in a case that is not yet completed. Dialectic, on the other hand, typically has its application to assessing the strength or weakness of an argument that already has been completed, as far as the case is known, and is there as a given case to analyze and evaluate. This process is typically a retrospective kind of assessment. The base line is set by examining the text and context of discourse in the case to determine what the conclusion is and whether the premises put forward support the conclusion. The retrospective aims of dialectical argumentation are to identify, analyze and evaluate arguments found in a given text. The two tasks are intimately connected in subtle ways that can best be explained by the resemblance theory.

The recent developments in argumentation and computational dialectic outlined in this paper indicate that the relationship between logic and rhetoric is becoming much closer than tradition has considered it to be for a long time. The closeness of this relationship will continue to be a worry to those of us who are concerned about the possibilities for abuse. Could dialectic be used for propagandistic purposes, as a public relations tool, once it is part of rhetorical invention? As noted above, this worry is very realistic, and Plato in particular, in his denunciation of the Sophists, gave eloquent voice to it a long time ago, a voice that still resonates. However, any applied subject has the potential for abuse. Balanced against that negative potential is the potential for uses that will benefit humanity. It is possible that the lawyers, political consultants and public relations experts, when they adopt the new dialectic combined with rhetorical invention to provide argumentation methods used in politics and advertising, will have better tools for their craft. But it is also possible that this same technology will be used as an applied argumentation tool for detecting the fallacies in these persuasion attempts, so that the art of mass persuasion may not be treated with any more distrust than it is now.

Rhetoric is perennially attractive and useful as a practical subject primarily because it can be applied to real cases. One of its primary goals, as an applied subject, should be to provide techniques that are actually useful to persuade an audience to accept a conclusion, or carry out an action. Dialectic is an abstract and normative subject, but it too can be useful because it can be applied to the criticism of arguments in real cases. Its primary goal, as an applied technology, should be to take actual cases of arguments and analyze and evaluate them critically. Its goal, so considered, is to provide methods that enable a person to judge, based on evidence, which arguments are stronger, which are weaker, and which are fallacious. Is it good enough for applied rhetoric to persuade an audience to persuade an audience by using arguments that the audience thinks are strong, never mind whether they are really strong or not, from a dialectical point of view? If so, why should rhetoric have any use at all for logic? A helpful answer, as we have shown, is provided by the resemblance theory. An audience will be persuaded by arguments it thinks are rationally convincing, and these are generally arguments that really are rationally convincing, or at least look to be so, even if they are defeasible.

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