

# DIALECTICAL MODELS IN ARTIFICIAL INTELLIGENCE AND LAW

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**Abstract.** Dialogues and dialectics have come to play an important role in the field of Artificial Intelligence and Law. This paper describes the legal-theoretical and logical background of this role, and discusses the different services into which dialogues are put. These services include: characterising logical operators, modelling the defeasibility of legal reasoning, providing the basis for legal justification and identifying legal issues, and establishing the law in concrete cases. Special attention is given to the requirements of law-establishing dialogues.

**Key words:** dialectics, dialogues, defeasible reasoning, mediating systems

## 1. Introduction

Dialectics and dialogues play an important role in the field of Artificial Intelligence and Law.<sup>1</sup> The three-ply arguments in the HYPO-system (Ashley 1991) can be seen as a kind of dialogues between hypothetical adversaries. This line is continued in later work building on the HYPO-foundations (e.g. Skalak and Rissland 1991 and 1992; Rissland, Skalak and Friedman 1996; Aleven 1997). More explicitly dialectical is the work of Gordon (1994 and 1995; Gordon and Karacapilidis 1997), Nitta et al. (1993 and 1995), Prakken and Sartor (e.g. Prakken 1995; Prakken and Sartor 1996), Loui et al. (1995 and 1997), Freeman and Farley (1996), and the research group at Maastricht University and the University of Twente (Hage et al. 1992 and 1994; Leenes et al. 1994; Lodder and Herczog 1995; Verheij 1996; Lodder 1998).

There seem to be two major grounds for this popularity of dialectics and dialogues, corresponding to both form and content of legal reasoning. Legal reasoning is centred around the application of rules and principles, and this kind of reasoning is defeasible. Dialectics provides a suitable tool to analyse and model this defeasibility.

Moreover, the law is an open system. As a consequence, there may be disagreement about the starting points of legal arguments, which in turn makes it uncertain which legal conclusions are justified. Dialogues provide a means to overcome the foundational difficulties that plague (legal) justification (Alexy 1978, p. 221f.). The open nature of the law makes the outcome of legal procedures indeterminate. I will argue in section 7 that, as a consequence, the law in concrete cases depends on the decision making procedure, without an independent standard for the correctness of this outcome. In other words, the law is the result of a procedure, and dialogues are a promising way to model such a procedure.

My purpose in this paper is to give an overview of dialectical models as they are used in the field of Artificial Intelligence and Law and the closely related fields of logic and legal

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<sup>1</sup> The difference between dialectics and dialogues, as I use these terms, is explained in section 5. Ahead of this explanation, dialogues can be taken to be real dialogues governed by a dialogue protocol whose content is based on the domain of the dialog. Dialectics is the more general category, which also includes dialog-like presentations of logical systems.

theory, and to distinguish between the different functions that these systems fulfil.<sup>2</sup> I will distinguish between three main functions, which will be discussed in turn. In the sections 2 to 4 I discuss dialectical garbs for what is essentially a definition of logical validity. In the sections 5 and 6 the topic is dialogical approaches to the establishment of the premises of arguments. The sections 7 to 10 deal with the dialogical, or, more generally, procedural, establishment of the law in concrete cases. This paper is summarised in section 11.

## 2. The pioneering work of Lorenzen and Lorenz

In their *From Axiom to Dialogue*, Barth and Krabbe distinguish three dimensions of logic systems (Barth and Krabbe 1982, pp. 3-13). One is the dimension of *syntax*. Important characteristics of a logic are the number and nature of the logical constants, the way in which the lexicon is divided into categories, such as terms and relations, and the ways in which sentences are constructed from elements of the lexicon.

The second dimension is the dimension of logical strength. Even given a fixed syntax, a logic may have more or less derivational power. Barth and Krabbe distinguish between (in increasing power) minimal, constructive (intuitionistic), and classical (propositional) logic, but for the purpose of Law and AI, nonmonotonic logics are relevant too, as even stronger than classical logic.<sup>3</sup>

The third dimension, which is the most important for this paper, is the dimension of garb. The 'same' logic can be presented in different forms. Barth and Krabbe distinguish between, amongst others, axiomatic, model-theoretic and dialectical presentation of a logic.

In my discussion of dialectical garbs for logical theories, I will deal with two ways in which a dialectical presentation of a logic can be fruitful. First comes the seminal work of Lorenzen and Lorenz, to illustrate some of the basic ideas behind the dialectical approach. And second, I will show how the dialectical garb can be used to model the defeasible nature of reasoning with rules and principles.

### 2.1 VALIDITY AS THE OUTCOME OF A WINNING STRATEGY

In their *Dialogische Logik*, Lorenzen and Lorenz (1978) show how it is possible to characterise logical validity in terms of critical dialogues, rather than by means of axioms or truth tables. Let me illustrate their approach by means of two examples.

The setting of the examples is that there are two dialogue parties, called P (proponent) and O (opponent). Both parties have an associated set of sentences (possibly empty) to which they are committed. Commitment means that parties are not allowed to attack sentences to which they are committed. P makes a claim, and O is allowed to attack this claim, thereby forcing P to defend it. There are rules governing this game of attacking and defending, and these rules are related to the logical operators. The basic idea is that a sentence *S* logically follows from a set of sentences *Premises*, if P has a winning strategy to defend *S* on the assumption that O is committed to the sentences in *Premises*.

Suppose that O is committed to the sentence *C*, and that P has claimed the sentence  $A \rightarrow (B \vee C)$ . The rules that define the logical operators (see section 2.2) specify how such a claim can be attacked. For the present case they imply that O must attack this claim by claiming *A*. This creates for P the obligation to claim  $B \vee C$  (or to attack *A*). The sentence  $B \vee C$  can be accepted by O, in which case P has succeeded in defending his origi-

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<sup>2</sup> Dialectical approaches are also important in other fields. See e.g. Hamblin 1970, pp. 253f. and Bench-Capon et al. 1992. Discussion of that work lies outside the scope of this paper.

<sup>3</sup> Nonmonotonic logics will usually have a different syntax than propositional logic, and in this respect, the comparison is not fully correct.

nal claim. However, O can also attack  $B \vee C$ . In that case P must claim either B or C. In our example, P would be wise to claim C, because O is committed to that sentence and is therefore not allowed to attack it. If P claims C, he wins the dialogue, and his original claim holds good. If P defends  $B \vee C$  by claiming B, however, O can attack B, and then P loses the dialogue because he has no way to defend this claim. The following table illustrates the first version of this brief dialogue.<sup>4</sup>

<b>P</b>	<b>O</b>
claim: $A \rightarrow (B \vee C)$	claim: A
claim: $B \vee C$	? $B \vee C$
claim: C	is committed to C, and loses the dialogue

The second version of the argument would run as follows:

<b>P</b>	<b>O</b>
claim: $A \rightarrow (B \vee C)$	claim: A
claim: $B \vee C$	? $B \vee C$
claim: B	? B
has no additional defence, and loses the dialogue	

As the different outcomes of the two dialogues concerning the same claim illustrate, the validity of a claim, given the commitments of the opponent, does not guarantee that the proponent wins the dialogue. However, it does guarantee that the proponent has a winning strategy (cf. version 1). It would be more in the spirit of Lorenzen and Lorenz to turn this around, and say that a claimed sentence logically follows from the commitments of the opponent, if the proponent has a winning strategy. Whether he actually uses that strategy in a dialogue does not matter.

## 2.2 DIALECTICAL CHARACTERISATION OF LOGICAL OPERATORS

Lorenzen and Lorenz do not only give a dialectical characterisation of valid conclusions; the meanings of the logical operators are also defined in terms of their dialectical use. I will illustrate this by means of the dialectical characterisation of the operators of propositional logic (Lorenzen and Lorenz 1978, p. 38).

### CONJUNCTION

If P claims  $A \& B$ , O can attack this claim by ?l and ?r. ?l may be read as 'Is the left conjunct true?', and ?r as 'Is the right conjunct true?'

This attack imposes on P the duty to defend the conjunction by claiming respectively A or B.

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<sup>4</sup> The example does not follow the syntax of Lorenzen and Lorenz.

<b>P</b>	<b>O</b>	<b>P</b>
A & B	?l	A
	?r	B

#### DISJUNCTION

If P claims  $A \vee B$ , O can attack this claim by ?. This attack imposes on P the duty to defend the disjunction by claiming either A or B.

<b>P</b>	<b>O</b>	<b>P</b>
A $\vee$ B	?	A
		B

#### IMPLICATION

If P claims  $A \rightarrow B$ , O can attack this claim by claiming A. This attack imposes on P the duty to defend the implication by claiming B, or by attacking A.<sup>5</sup>

<b>P</b>	<b>O</b>	<b>P</b>
A $\rightarrow$ B	A	B

#### NEGATION

If P claims A, O can attack this claim by claiming  $\sim A$ . If this happens, P has lost the dialogue game. Given this consequence, O is only allowed to make this attack if he was not committed to A.

<b>P</b>	<b>O</b>
A	$\sim A$

### 2.3 SOME CHARACTERISTICS OF THE DIALOGISCHE LOGIK

There are four characteristics of the approach of Lorenzen and Lorenz to which I want to draw the reader's attention, because they are important in relation to the other work that will be discussed.

- a) *The dialogue steps correspond approximately to the steps within a single argument.* If the dialogue games are compared to proofs in syntactic renderings of logic, a dialogue move together with the answer to it are the counterpart of a proof step. For instance, in the proof theory of propositional logic it is possible to derive  $A \vee B$  from A in one step. The dialogical version of this step is that the claim that  $A \vee B$  is questioned and then defended by claiming A.
- b) This correspondence can be explained by the fact that the traditional proof steps are based on the meanings (semantics) of the logical operators, while these same meanings are in the view of Lorenzen and Lorenz defined by the dialogue rules that are attached to them. *The dialogue rules reflect the logical meanings of the operators (or the other way round).*

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<sup>5</sup> If O succeeds in defending A, P still has the duty to defend the implication by claiming B.

- c) *To determine whether a sentence follows from other sentences, it is necessary to consider all possible dialogues.* Logical validity is an evaluative notion, not a purely descriptive one. It is possible to make mistakes in arguing for a conclusion, and as a consequence it is impossible to define the validity of a conclusion given a set of premises in terms of the actual reasoning behaviour of dialogue parties. That is why the definition of logical validity makes use of all possible dialogue games, by working with the notion of a winning strategy.
- d) *The dialogue games assume a fixed set of commitments (premises).* This is a consequence of the fact that the dialogues aim at characterising the notion of logical consequence. It does not matter whether the conclusion of a dialogue or a winning strategy is true or false; the only thing that matters is whether the conclusion follows from a set of premises. That is why the notion of a winning strategy presupposes a set of premises for which this strategy exists. Winning strategies are relative to a set of commitments, just like valid conclusions are relative to a set of premises.

This ends the description of the seminal work of Lorenzen and Lorenz, which deals with the dialectical characterisation of the logical operators and of logical validity. In the next section we will see that dialectics can also be used to model a quite different aspect of reasoning, namely its defeasibility.

### **3. Defeasibility and dialectics**

Most legal reasoning is based on the application of rules and principles. This even holds for case-based reasoning, because the decision in an old case is only relevant for a new case if one employs the principle that similar cases are to be treated similarly. Moreover, the identification of the relevant factors in a case presupposes principles (Kaptein 1995).

Reasoning with rules and principles is defeasible. Normally, a rule will be applied and its conclusion follows if its conditions are satisfied. Sometimes, however, a rule should not be applied, even though its conditions are satisfied. If such a situation occurs, the conclusion of the rule does not follow. For instance, the rule that thieves are punishable is normally applied if somebody is a thief. The conclusion that this person is punishable follows 'by default'. However, if this person turns out to be completely insane, the rule should not be applied, and the conclusion that this insane person is punishable does not follow.

Principles only lead to provisional conclusions, and only after balancing the reasons based on all applicable principles can the definitive conclusion be established. For instance, thieves ought to be punished, and the fact that somebody is a thief is a reason why this person ought to be punished. As long as no other relevant information is considered, the conclusion should be that this person ought to be punished. If this person turns out to be a minor, however, there is also a reason why this person ought not to be punished, because of the principle that minors ought not to be punished. Only after weighing the reasons for and against punishing, the conclusion can be drawn whether this minor thief ought to be punished. The result of this weighing of reasons may be that our minor thief ought not to be punished.

In both cases, when the application of a rule is blocked, and when the reason based on a principle must be weighed against other reasons, the addition of new information (an exception to a rule, or the applicability of a conflicting principle) can take away the justification of a conclusion that was previously justified (Hage 1997a, p. 123). As my use of the word 'new' in the previous sentence already indicated, defeasibility of arguments is strongly connected with a procedural view of reasoning. In this respect, defeasibility differs from the notion of nonmonotonicity, with which it is sometimes identified. (Non)monotonicity is a

characteristic of a system of logic. If a logic is monotonic, the valid conclusions of a theory are a subset of the valid conclusions of every superset of this theory. This definition does not involve the notion of time, let alone of a procedure. Defeasibility, on the contrary, has to do with an increase of information over time. At a certain moment in time, when a particular amount of information is available, it is justified to draw some conclusions. At a later moment, when more information has become available, not all of these previously justified conclusions can be justified anymore, either because the rule on which they are based should not be applied, or because new reasons against the conclusion have become available.<sup>6</sup>

Although defeasibility is intimately connected with the idea of time and therefore also with the idea of a process, it does not automatically lead to the notion of a procedure, let alone a dialectical procedure. For instance, the acquisition of knowledge by a single person over time will involve the defeat of arguments based on incomplete relevant information, and of the conclusions of these arguments. Often, however, the defeat of an argument and its conclusion will be based on new information introduced by one's opponent in a legal debate. That makes it particularly attractive to use a dialectical way of characterising defeasible reasoning.

### 3.1 BATTLES OF ARGUMENTS

Such a dialectical way of characterising defeasible reasoning has recently become rather popular. Several authors have modelled defeasible reasoning as a battle of arguments.<sup>7</sup> Given a set of premises and some underlying logic, it is possible to formulate a number of arguments that lead to different conclusions.

Arguments can be in conflict in basically two ways.<sup>8</sup> First, it is possible that the conclusions of two arguments are incompatible.<sup>9</sup> This would be the case if there are conflicting applicable principles. Then, the weaker of the two arguments is defeated.<sup>10</sup> It is also possible that an argument directly attacks another argument, without having an incompatible conclusion. An argument may, for instance, lead to the conclusion that a rule employed in another argument suffers from an exception, without saying anything about the conclusion of that other argument. In that case the attacked argument is defeated.

The picture sketched is complicated a little because an argument can only defeat another argument if it is itself undefeated. As a consequence, the question whether an argument is defeated can only be answered by considering sets of arguments. One set consists of defeated arguments, the other of undefeated arguments.<sup>11</sup> The basic idea behind this approach is

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<sup>6</sup> The temporal aspect of defeasible reasoning is emphasised in Verheij's CumulA-model. Verheij 1996, p. 107f.

<sup>7</sup> Proponents of this view are Loui (1987), Pollock (e.g. 1987 and 1994), Vreeswijk (1993a), Dung (1995), Verheij (1996), and in the field of AI and Law, Gordon (1994 and 1995), Prakken (e.g. 1993 and 1995) and Sartor (e.g. 1994).

Although my own work on Reason-Based Logic (e.g. Hage 1996 and 1997) exhibits qua results a strong resemblance to the most recent work of Verheij, Prakken and Sartor, it does not employ the notion of an argument and it has an ontological bias that is lacking in the argument-based approaches to defeasible reasoning.

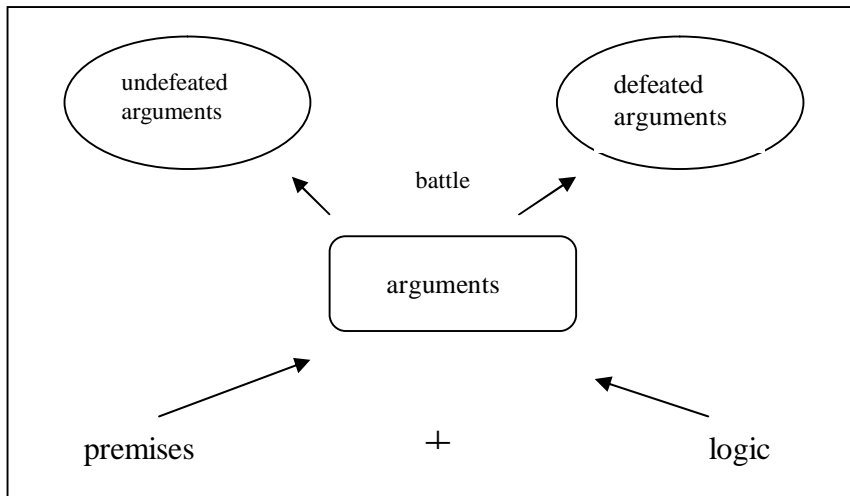
<sup>8</sup> The following characterisation of defeat abstracts from many different concrete logics and does not necessarily conform to any one of them, although - I think - it captures the spirit of most of them.

<sup>9</sup> The notion of incompatibility is left open to further definition. Logical inconsistency is an obvious candidate to be a form of incompatibility.

<sup>10</sup> Which argument, if any, in a conflict is the weaker, needs further specification in a domain theory.

<sup>11</sup> The variant where a battle of two arguments remains undecided is also possible. In that variant the arguments and their conclusions are divided into three categories: justified, defensible, and overruled. Cf. Prakken and Sartor 1996.

that the set of conclusions that can validly or justifiably be drawn from a set of premises by means of the underlying logic consists of the conclusions of the undefeated arguments.<sup>12</sup> See figure 1.



**Figure 1: Battle of arguments**

Take, for instance, the following case<sup>13</sup>:

- I. Mary testified that John is a thief.
- II. It is well-known that Mary often lies.
- III. John is a minor.
- IV. John is a repeat-offender.

Moreover, the following principles are valid:

- a) Somebody is a thief, if there is a testimony to that effect.
- b) Testimonies of persons who are well-known liars should not be taken into account.
- c) Thieves ought to be punished.
- d) Minors ought not to be punished.
- e) The fact that somebody is a minor is considered to be a stronger reason against punishing this person, than the fact that this person is a thief is a reason for punishing.
- f) If somebody is a repeat-offender, his or her minority is disregarded.
- g) Normally, nobody should be punished.
- h) If somebody is a thief, there is an exception to principle g.

Given these facts and principles, the following arguments are possible:

1. Mary testified that John is a thief. Therefore John is a thief. Therefore John ought to be punished. For the same reason, there is an exception to principle g.
2. It is well-known that Mary often lies. Therefore Mary's testimony ought to be disregarded.

<sup>12</sup> In the case of defeasible argumentation, the notion of the validity of an argument becomes ambiguous. Defeasible arguments are not valid in the traditional semantic sense that the truth of the premises guarantees the truth of the conclusion. They may still be valid in the sense that their conclusions are justified by their premises. Those who want to stick to the semantic notion of logical validity must choose another term for the goodness of defeasible arguments. That is why I wrote about conclusions that can validly *or justifiably* be drawn. Personally I prefer to widen the notion of logical validity (cf. Hage 1997a, chapter VI), and in the remainder I will also write about validity in connection with defeasible arguments.

<sup>13</sup> For the sake of a clear presentation, I made some sacrifices on logical precision.

3. John is a minor, therefore John ought not to be punished.
4. John is a repeat-offender. Therefore his being a minor ought to be disregarded.
5. Being a minor outweighs being a thief. Therefore argument 3 defeats argument. 1.
6. Nobody should be punished. Therefore John should not be punished.

Argument 4 defeats argument 3. As a consequence argument 3 cannot defeat argument 1 anymore, as it would in principle do because of argument 5.

It seems therefore that John ought to be punished, because he is a thief and there is an exception to principle g. However, the argument leading to the conclusion that John is a thief is defeated because it is well-known that Mary often lies.

As a consequence it turns out that argument 6 is not defeated, and that John ought not to be punished.

The arguments are divided as follows:

<b>Undefeated</b>	<b>Defeated</b>
2) It is well-known that Mary often lies. Therefore Mary's testimony ought to be disregarded.	1) Mary testified that John is a thief. Therefore John is a thief. Therefore John ought to be punished. Also therefore, there is an exception to principle g.
4) John is a repeat-offender. Therefore his being a minor ought to be disregarded.	3) John is a minor, therefore John ought not to be punished.
6) Nobody should be punished. Therefore John should not be punished.	5) Being a minor outweighs being a thief. Therefore argument 3 defeats argument. 1.

### 3.2 STATIC DIALECTICS

In Prakken and Sartor 1996, the above view of defeasible reasoning as a battle of arguments is cast in a dialectical shape. The conclusion of an argument holds good as long as no defeating counterargument is produced. If such a counterargument is produced, the original conclusion can be reinstated by producing a counter<sup>2</sup>argument. A counter<sup>3</sup>-argument would then defeat the conclusion again, and so on ... One can imagine a debate between two parties where each party is allowed to defend some thesis by providing an argument that has this thesis as its conclusion. Moreover, they are also allowed to produce counterarguments to their opponent's arguments.

For instance, the public prosecutor (PP) adduces argument 1 to the effect that John ought to be punished. This argument would defeat basic argument 6 to the effect that John ought not to be punished. The defence produces counterargument 3 in combination with argument 5 to the effect that argument of the PP does not hold good. This counterargument reinstates basic argument 6. The PP counterattacks with argument 4, thereby reinstating argument 1. Then the defence comes with argument 2, thereby reinstating argument 6.

Given a set of premises and a system of logic, there may be a winning strategy to defend a particular conclusion. In the above example, for instance, there is a winning strategy for the conclusion that John ought not to be punished. Valid conclusions can then be defined as conclusions for which a winning strategy obtains. This is the counterpart in nonmonotonic logics of the definition of the logical operators in terms of dialogues.

Notice that this kind of dialectics assumes a fixed set of premises and implicitly (because of the notion of a winning strategy) deals with all arguments that are possible given these premises. In fact, there is a clear parallel with the way in which Lorenzen and Lorenz em-

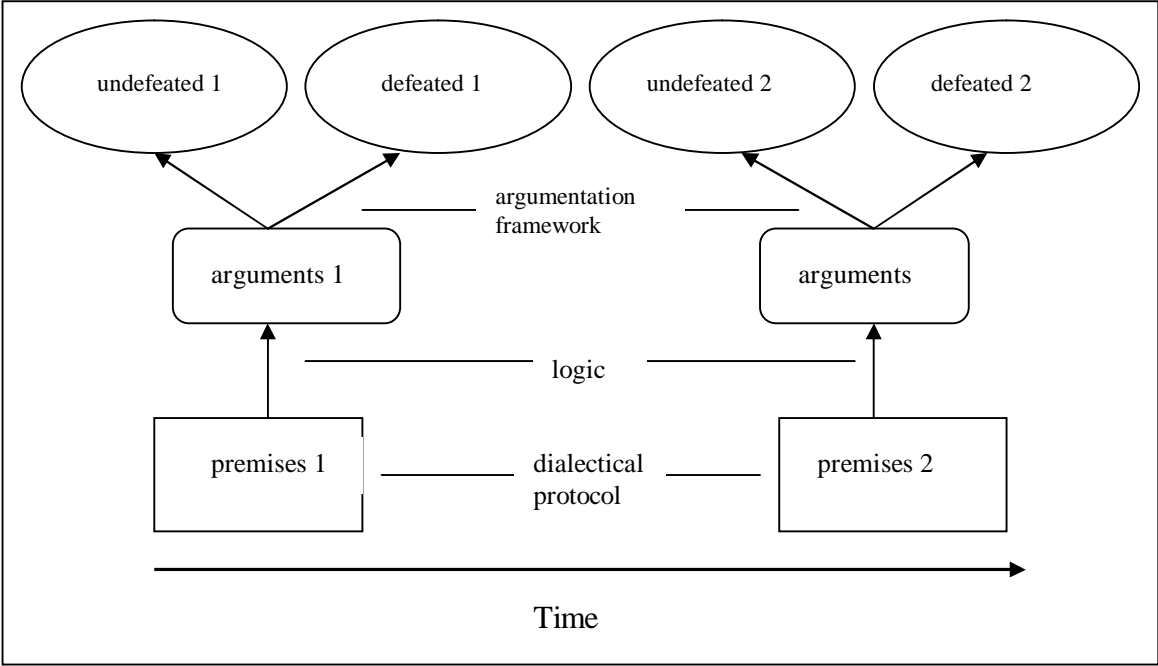


ployed dialectics. In both cases, the purpose of the dialectics is to clarify the notion of logical validity. This explains that a fixed set of premises is assumed, and that all possible dialogues are taken into consideration. Nevertheless there are also important differences. The battle of arguments approach is not committed to a particular logic. The notion of validity with which it is concerned is not the validity of an argument within such a system of logic, but rather the status of an argument on the basis of a framework that deals with the battle of arguments. This framework presupposes the internal validity of arguments. As a consequence, the dialogue steps deal with arguments as a whole, and not with the steps of a logical proof, unless the steps of the logical proofs may define subarguments, which are in their turn relevant for when one argument defeats another one. Moreover, the dialogues do not characterise the meanings of logical operators, but rather a theory of when one argument defeats another argument.

Because this form of dialectics assumes a fixed set of premises and takes all possible dialogues into account, the notion of time plays no role in it. That is why I propose to call this form of dialectics *static*.

3.3 DYNAMIC DIALECTICS

As the above discussion of static dialectics illustrates, modelling defeasibility as a battle of arguments does not automatically lead to a dynamic approach. However, Prakken (1995) developed a three-layered model of legal argument, in which dynamics plays a crucial role. The three layers in Prakken's model consist of a system of logic, an argumentation framework, and a dialectical protocol. Given a set of premises, the logic determines the set of possible arguments. The argumentation framework then sorts out the arguments into the defeated and the undefeated ones. The dialectical protocol determines how the set of premises, which functions as input to the logic and the argumentation framework, can evolve in time.<sup>14</sup> For instance, the protocol allows dialogue parties to add new premises, or to retract premises that turn out to be indefensible. See figure 2.



**Figure 2: The three-layered model of developing argumentation**

<sup>14</sup> In his 1997 (p. 273/4), Prakken distinguishes a fourth layer, which deals with dialogue strategies.

This model crucially differs from the one described above, where the dialectics only functions as a means to characterise valid conclusions in defeasible reasoning. The principal difference is that the present model takes the factor of time into account, and has a non-deterministic element in that the dialectical protocol allows dialogue parties to change the set of premises. Which changes will be made is up to the parties, and as a consequence the valid conclusions at one point in time do not determine the valid conclusions at a later point in time.<sup>15</sup> To highlight the difference between static dialectics and the present model, dialectical models that incorporate players and time will be called *dynamic dialectical*. Such dynamic models are negatively characterised by not assuming a fixed set of premises, and consequently also by not dealing with all possible arguments.<sup>16</sup> Therefore their main purpose will not be the characterisation of logically valid arguments, or of conclusions that are justified relative to a set of premises.

#### 4. Variations on the dialectical theme

In the literature up till now, several functions for dialectical systems have been mentioned. I will discuss three of them.

##### 4.1 THE HYPO-SYSTEM

A well-known example of a static dialectical system is Ashley and Rissland's HYPO (Rissland and Ashley 1987; Ashley 1991). HYPO is a static system in that it uses a fixed set of cases as the premises from which arguments can be constructed. It is a dialectic system in that it generates three-ply arguments, where the first ply is the basic argument, the second ply an attack on the basic argument, and the third ply an attack on the second ply. The argument of the third ply, so to speak, reinstates the argument of the first ply.

Although HYPO is not primarily interested in establishing the validity of a conclusion given the current case and the cases from its case base, it exhibits interesting similarities to systems that deal dialectically with defeasible arguments. For instance, HYPO considers all possible arguments given the cases that are at its disposal. This is done by sorting the cases in a Claim Lattice on the basis of their similarity to the current case. Since arguments are closely related to the position that cases take in this Claim Lattice, the generation of the Claim Lattice is comparable to the generation and comparison of all possible arguments. Moreover, the three argument plies where each ply attacks the argument of the previous ply is very similar to the battle of argument model of defeasible reasoning.<sup>17</sup>

##### 4.2 DIALECTICS AS MODELS OF BOUNDED RATIONALITY

Because humans sometimes reason irrationally, systems that aim to characterise valid reasoning dialectically tend to consider all possible arguments rather than arguments that were actually produced by human reasoners. Nevertheless it is possible to use actual, rather than all possible, dialogues to model rationality. Loui and Norman (1995) have presented a theory in which dialogues are used to model rationality, in particular bounded rationality.

Their model can be seen as a variation of the three-layered model of Prakken that was presented in section 3. Prakken considered changes in the set of premises over time. Every

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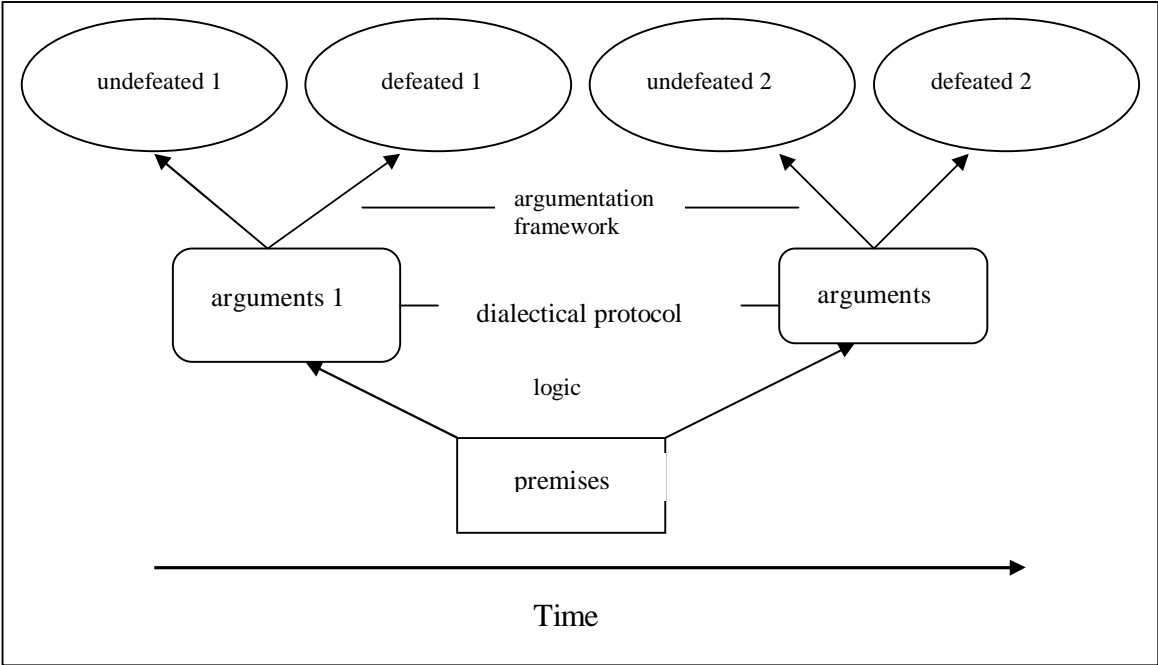
<sup>15</sup> An exception must be made in case the dialectical protocol does not allow changes in the premises that change the set of valid conclusions. Such a protocol would make little sense, however, because the whole point of having a dialogue is to introduce some indeterminism.

<sup>16</sup> Dynamic dialectics may deal with all possible arguments at a particular stage of the argumentation.

<sup>17</sup> A logical analysis of the HYPO reasoning mechanism that can easily be translated into the battle of arguments-model, can be found in Hage 1993, Hage 1996, section 34.2 and in Hage 1997a, pp. 185f. See also Prakken and Sartor 1997, and Bench-Capon 1997.

stage in the process is characterised by a set of premises. Given a system of logic, the premises of a particular stage make a number of arguments possible. Consequently, a stage is also characterised by a set of arguments. An argumentation framework determines for every stage and the set of arguments that characterises it which conclusions can validly be drawn.

The model of Loui and Norman differs from Prakken's model in that stages are not characterised by sets of premises but rather by the sets of arguments that were actually adduced. In fact, Loui and Norman assume a fixed set of premises and consider only the arguments that, given some system of logic, are possible given those premises. Remember that Prakken considered all arguments that were made possible by the premises of a stage. Since humans are not capable to generate all arguments that can be based on their beliefs, they must work with the arguments that they have actually thought of.<sup>18</sup> If one's belief or behaviour is in agreement with what one has actually considered, it is in some sense rational. The logical counterpart of this form of bounded rationality is that the battle of arguments only takes place between the arguments that were actually produced in a dialogue, and this is precisely what Loui and Norman propose. See figure 3.



**Figure 3: A dialectical model of bounded rationality**

Verheij (1996) has proposed a system, CumulA, which is similar to that of Loui and Norman in that it makes use of argument stages. It has the additional feature that not only the set of arguments, but also the set of premises is allowed to vary over time. Consequently it combines features of Prakken's three-layered model and the system of Loui and Norman. CumulA does not incorporate dialogue protocols, however.

4.3 DIALECTICS AS A COMPUTATIONAL STRATEGY

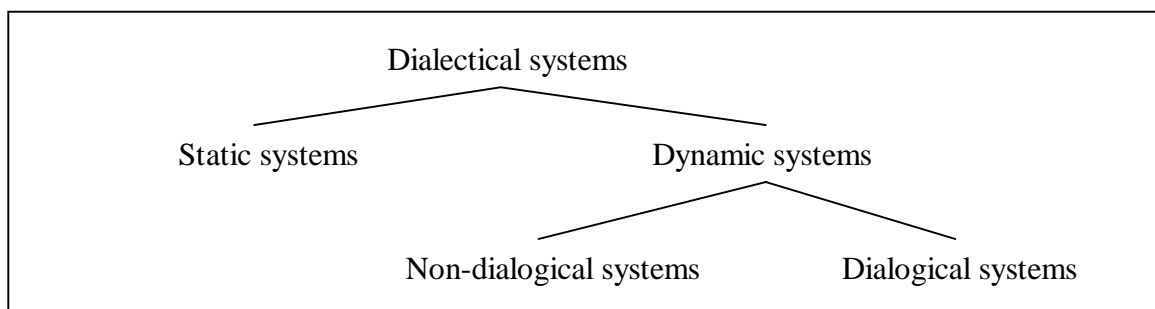
Vreeswijk (1993a, chapter 7) discusses the use of dialectics to cope with limited (computational) resources. Summarily stated his ideas boil down to the following. If one wants to

<sup>18</sup> Other models of bounded rationality are not based on the arguments that are actually thought of, but rather those who rationally should have been thought of. It is possible to think of many variations in this connection.

know whether an argument holds good given a set of premises, one need only consider this argument itself, the arguments that attack it, their attackers, etc.... It is not necessary to determine for every argument that is possible given the premises whether it is defeated or not. By constructing a dialectical tree of arguments, counter-arguments, counter<sup>2</sup>-arguments, etc. it is possible to limit the search through the space of arguments that can be based on the premises.

## 5. Truth and justification; a philosophical digression

Dynamic dialectical systems can be subdivided into systems whose dialogue protocol largely reflects the system's underlying logic and systems where the dialogue protocol is to a large extent inspired by the domain on which the system is to operate. These latter dynamic dialectical systems, I will call *dialogical*. See figure 4. The transition between merely dialectical systems and dialogical ones is a gradual one.



**Figure 4: Dialectical systems**

Dialogical versions of legal reasoning systems are inspired by two phenomena. The first is that legal issues often arise in disputes between two parties, that is, in dialogues. Dialogical systems mimic, so to speak, legal practice.

Next to this practical source of inspiration there is more theoretical one, exemplified in Gordon's work on the Pleadings Game. A major source of inspiration for Gordon was Alexy's theory of legal reasoning (Alexy 1978), which was, to my knowledge, the first dialogical theory of legal reasoning. Alexy was, in turn, inspired by the revival of the rhetorical approach to argumentation (e.g. Perelman and Olbrechts-Tyteca 1969), and by dialogical approaches to truth (Habermas 1973) and justification (e.g. Schwemmer and Lorenzen 1973). I will say somewhat more about this German work and its philosophical background, because it is essential for a good understanding of the differences between dialogical approaches to legal reasoning and dynamic dialectical approaches that are not dialogical.

### 5.1 HABERMAS' CONSENSUS THEORY OF TRUTH

Many philosophers (e.g. Devitt 1991 and Searle 1995) endorse a realist ontology and the correspondence theory of truth. They assume that there is a world independent of our knowledge of it, and that an assertive sentence is true if the state of affairs expressed in it obtains in that independent world, and false if it does not obtain. These views taken together lead to well-known problems concerning truth and knowledge. The truth of sentences, or, in general, all representations of reality, depends on a relation between these representations and reality. All we humans have are representations of this reality, for instance in the form of sensory perceptions, and we are unable to grasp directly the reality beyond the representations. Everything we can say or believe about that underlying reality is itself again a representation. Truth in the sense of correspondence is not something we can ascertain.

This insight has led Habermas (1973) to the conclusion that if we discuss the truth of a sentence, we are not really concerned with the correspondence of this sentence with reality, but rather with whether this sentence rightly claims what it does claim. This rightness, Habermas continues, does not depend on an inaccessible relation between this sentence and reality, but rather in the possibility of upholding the sentence in a critical discussion. In this way, Habermas arrives at his consensus theory of truth: a sentence is true if it can be upheld in a completely rational discussion.

Notice that it is not an actual consensus that decides about the truth of a sentence, but the hypothetical consensus that would be achieved if a discussion were fully rational. Habermas (1973, p. 255/6) discusses a number of demands on discussions that are necessary to safeguard their rationality. Amongst these are the demands that:

All potential participants in a discussion must have equal chances to participate. They must any time be able to open and continue discussions.

All participants must have equal chances to offer interpretations, statements, recommendations, explanations and justifications, and to question them.

All participants should have equal chances to use representative speech acts, that is to express attitudes, feelings and intentions.

All participants should have equal chances to use regulative speech acts, such as to command and to resist, to permit and to forbid.

Habermas' theory resembles the work of Lorenzen and Lorenz and dialectical renderings of defeasible reasoning, which also operate with the outcome of rational discussions. Still there is a difference, because the work of Lorenzen and Lorenz, and, for instance, Prakken and Sartor, assumes a finite set of premises and considers argument strategies that enable one to win a discussion against all possible opposition, where the possible forms of opposition can be constructed on the basis of the premises and the logic. The rationality is, in the views of Lorenzen and Lorenz and in the battle of arguments-theoreticians, embodied in the demand to consider all dialogues.

Rational discussions in the sense of Habermas do not have a fixed set of premises. This has two consequences. First, the rationality of the discourse cannot be maintained by considering all possible arguments, because the set of all possible arguments is indeterminate. As an alternative Habermas uses constraints on the settings of the dialogue.

Second, a dialogue according to Habermas has no fixed outcome, because its purpose is not to characterise logical validity, which is relative to a set of premises and a matter of form, but to define truth, which is absolute and a matter of content. This difference explains the difference in determinacy. Moreover, it is relevant for the difference between dialogical and other dialectical versions of legal reasoning systems. The latter only deal with the validity or rationality of (legal) reasoning, while the former tend to focus on the correctness of the outcome of legal discussions. Very briefly stated, dialogues deal with content, while other forms of dialectics deal with form.

That dialogues deal with content explains why Habermas places constraints on dialogues that lead to truth. These constraints are meant to ensure that everything that may be relevant for the outcome of the discussion will be adduced. Comparable constraints are lacking in static dialectical systems, where the set of premises is not only fixed, but its contents and origin are irrelevant.

## 5.2 OVERCOMING FOUNDATIONALISM

Where the concern of Habermas was semantic or ontological, the so-called Erlangen Schule was concerned with the justification of ethical and empirical 'knowledge'. The traditional model of justification holds that some thesis is justified if it can be derived (usually: de-

duced) from justified premises. This view of justification suffers from an unbounded recursion. It presupposes a basis of justified premises, the justification of which does not depend on derivation from other justified premises. The problem, which is typical for all 'foundationalist' theories of knowledge (Lehrer 1990, pp. 39f.), is that such a basis can only be found by dogmatising some premises.

The solution to this problem that was proposed by Schwemmer, a member of the school of Erlangen, is that the basis of justification is only assumed as long as it is not brought up for discussion. For instance, it is possible to justify  $C$  by means of an argument on the basis of the premises  $A \rightarrow C$ , and  $A$ . As long as these premises are not questioned, the justification succeeds, and  $C$  is considered to be justified. But it remains possible to question  $A$ ,  $A \rightarrow C$ , or both, and when this happens, these premises must be justified. Such a justification makes in turn use of premises that are temporarily assumed, but that can always be questioned and brought up for discussion (Alexy 1978, p. 181 on Schwemmer; see also Hage 1997a, pp. 126f.).<sup>19</sup>

Schwemmer's solution to the problem of foundationalism rests on the exchange of content for form. The content that is abandoned consists of the premises that would have to be accepted dogmatically. The form that comes in its place is the procedure that allows an audience to question the assumptions of some particular justification. This exchange of content for form is similar to the way in which Habermas replaced reality as the basis for truth by consensus in a rational discussion. Nevertheless there is an important difference. Habermas insistence on the rationality of discussions, which related his work to that of Lorenzen and Lorenz, and of the battle of arguments-theoreticians, and that is embodied in constraints on rational discussions, is abandoned in Schwemmer's solution. It is the *actual* questioning of assumptions that creates the obligation to extend the justificatory chain, not the mere possibility of questioning the premises. Indeed, if it were the (absence of the) possibility of challenging the premises that counts for justification, the unbounded recursion, which Schwemmer attempted to circumvent, would re-occur.

### 5.3 LAW AS REASON-BASED FACT.

The question might well be raised why the ideas of Habermas and Schwemmer, which are not so familiar, have had such a strong influence in the fields of legal theory and of Law and AI. Part of the answer will probably be that dialogues were already familiar in the law, so that the theoretical framework proposed by Habermas and Schwemmer struck a familiar chord, which facilitated its acceptance.

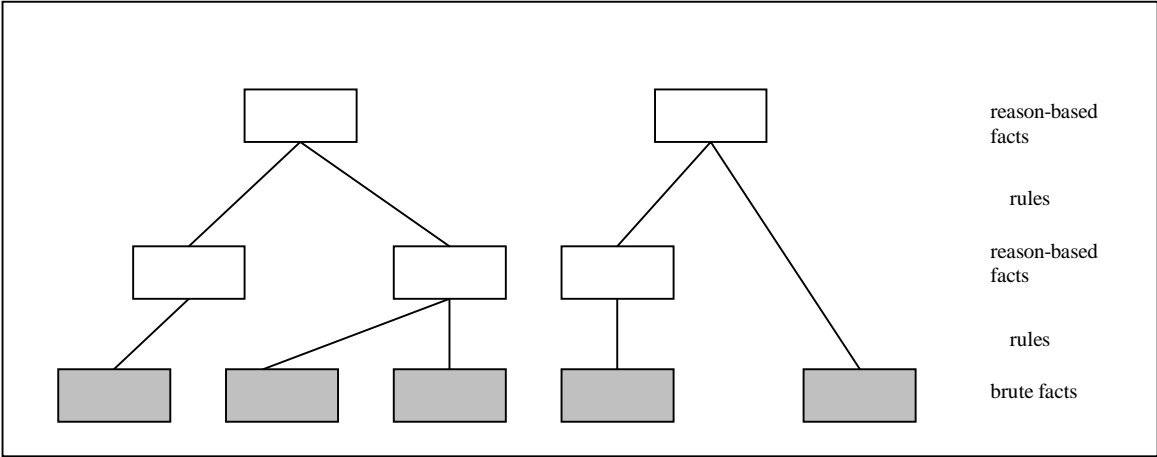
To see another part to the answer, we must return to the ontology sketched above. According to this realistic ontology, reality is independent of our knowledge of it. For instance, Mount Everest would also have existed, and would be snow-covered, if no conscious being had existed and no-one would have known about it. This realistic picture may be correct for brute facts such as the existence of Mount Everest and its being snow-covered, but it is certainly not correct for large parts of reality that consist of so-called reason-based, or institutional facts (Anscombe 1958, MacCormick and Weinberger 1986, Ruiters 1993, Searle 1995, and Hage 1987 and 1997a). The existence of money, of football matches, of governments, of statutory laws, and of legal obligations is certainly not independent of human

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<sup>19</sup> This approach to justification has some similarities with Popper's views on falsification (Popper 1972). A theory may be falsified because conclusions that are deduced from it are considered to be false. Such a falsification presumes that the 'data' against which the theory is tested are correct themselves. Such a presumption can never be more than another falsifiable hypothesis, however. In a sense it depends on the scientific dialogue which theories are temporarily assumed to be data, and are assumed to be fit to test other theories against.

minds. All of these are 'built' (constituted) on top of other facts or entities, which are the reasons for their existence. The connection between reason-based facts and the facts that are the reasons for their existence is created by rules that are adopted by humans. For instance, the rule that one ought to repair tortuously caused damages makes that the fact that John tortuously damaged Jennifer's car into the reason why John ought to repair the damages to Jennifer's car.

Reason-based facts are facts that are built on top of other facts, which are either brute, or themselves reason-based. The connection between reason-based facts and the reasons for their existence is created by rules that are adopted by humans. See figure 5.



**Figure 5: Reason-based facts**

The distinction between brute facts and reason-based facts has profound implications for the distinction between truth and knowledge. The presence of brute facts may be observed directly, or it may be inferred from other facts that provide evidence for their presence (e.g. smoke provides evidence for fire). In both cases, there is an independent standard for the correctness of our knowledge, that is, whether these brute facts actually obtain. Even if our knowledge is based on evidence, and therefore on a rule that allows us to consider these particular facts as evidence, the rule can be tested by comparing the outcome of its application with what can be observed to be really the case. The truth of a sentence that describes a brute fact is independent of our way of knowing this fact.

Our knowledge of reason-based facts can, on the contrary, only be based on our knowledge of their underlying reasons. If we want to know whether John ought to repair the damage to Jennifer's car, we must apply the rule about tort to the facts of their case to (re-)construct the legal consequences of the case. Moreover, there is no independent standard to establish whether our construction was correct. The only available test is to re-apply the legal rules. It is not possible to test the rules by means of our observation whether the legal consequences established by means of the rule 'really' obtain. In other words, the distinction between truth and knowledge, which characterises brute facts, is absent in the case of reason-based facts. If the best procedure to obtain knowledge about reason-based facts has been followed, it makes little sense to ask the question whether this 'knowledge' is true.<sup>20</sup>

<sup>20</sup> This only holds for the step from the brute facts to the reason-based facts. Knowledge about reason-based facts always has a component of knowledge about brute facts, and for this knowledge it remains possible to ask whether it is correct.

The second part of the reasons why dialogical, or, more generally, procedural, approaches to the law are so popular is, in my opinion, that the law in actual cases consists of reason-based facts, facts that are the result of the application of legal rules. It is only possible to establish these facts by applying the rules. In other words, it is only possible to establish what the law in a concrete case is by means of a procedure. Legal dialogues are obvious examples of such procedures. In section 7, after a discussion of Gordon's Pleadings Game, I will return to this procedural view of the law.

## 6. Gordon's Pleadings Game

A recurring theme in legal theory is how legal consequences in a particular case can be justified (e.g. Larenz 1983, MacCormick 1978, Alexy 1978, Aarnio 1987, and Peczenik 1989, Hage 1997a). Just like other foundational enterprises, this one suffers from what has come to be known as the *Münchhausen trilemma*, after the legendary baron who pulled himself by his hairs out of the swamp (Albert 1968, p. 11f.). A full justification of the legal consequences would be the result of a valid argument with justified premises. As we have seen above, the demand that the premises from which the argument starts are justified creates problems. Either this demand evokes a boundless recursion (infinite regress) of founding arguments, or the justifying chain of arguments is circular, or some premises are assumed by denying that they need additional justification (by making them into dogmas).

To evade this trilemma, Alexy (1978) proposed to take a procedural approach to legal justification. Building on ideas of Habermas (1973), Schwemmer and Lorenzen (1973) and Perelman (Perelman and Olbrechts-Tyteca 1969), he considers a conclusion to be justified if its proponent has convinced its opponent in a dialogue that satisfies certain constraints. These constraints derive both from general considerations about dialogues, and from special demands from the legal domain. Following Alexy, similar proposals have been made by Aarnio (1987) and Peczenik (1989) (see also Feteris 1994 and Hage 1997b). The purpose of the dialogues is in this case to establish a set of premises shared by the proponent and the opponent of a thesis, from which the thesis can validly (in the case of Alexy: deductively) be derived. If it is not possible to establish such a common basis, the thesis cannot be justified. The finding of a common basis is in the law facilitated by the fact that a number of premises are accepted by default, because they are part of established law.

As is well-known, the ideas of Habermas and Schwemmer influenced Alexy, while Alexy's views have been used by Gordon to develop his Pleadings Game (Gordon 1994 and 1995).<sup>21</sup> Through this work these ideas effectively entered into the field of Artificial Intelligence and Law (Gordon 1991, 1994, and 1995; but cf. also Hage 1987 and Hage et al. 1992 and 1994). However, the purpose of the Pleadings Game is not legal justification, but rather to establish the legal and factual issues that separate the parties in a legal conflict. Nevertheless, the topic with which the Pleadings Game deals is very similar to that of legal justification, namely the establishment of the premises for legal justification. Where Alexy aims at the justification of a legal judgement by finding a common set of premises from which the judgement follows, the Pleadings Game aims at finding premises about which parties disagree and that explain their disagreement about what should be the outcome of their case.

There is another difference. Whereas Alexy takes his starting point in the approach of Habermas, with strict constraints on the procedure to guarantee a rational outcome, Gordon assumes only a few of the Alexyan constraints, with the effect that his procedure is more like Schwemmer's that takes actual rather than rational consensus as crucial. In particular,

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<sup>21</sup> Gordon also describes the Trial Game, which will be left out of consideration here.



Gordon skips all the argument forms, the justification rules, the rules for transition between discussion types, the rules and forms of internal and external legal justification, and the special legal forms of reasoning, which Alexy poses as constraints on legal discussions (Alexy 1978, pp. 361f.). The constraints assumed by Gordon (1994, p. 243) are:

No party may contradict himself.

A party who conceded that a rule is valid must be prepared to apply the rule to every set of objects that satisfy its antecedents.

An argument supporting an issue may be asserted only when the issue has been denied by the opponent.

A party may deny any claim made by the opponent, if it is not a necessary consequence of his own claims.

A party may rebut a supporting argument for an issue he has denied.

A party may defeat the rebuttal of a supporting argument for one of his own claims, if the claim is an issue.

Like the battle of argument-approaches, Gordon takes full arguments as the building blocks of dialogues. This can be explained from the fact that Gordon uses an adapted version of Conditional Entailment (Geffner and Pearl 1992) as the logic in which arguments are to be cast. Since this is a logic for defeasible reasoning, it can profitably be cast in a dialogical form. This is exactly what Gordon does, and - as we have seen in section 3 - for the purpose of handling defeasibility it is not necessary to split up the arguments into their steps.

However, where the establishment of premises is concerned, it would be better if the arguments were split up. Let me illustrate this by means of a simple example. Suppose that P and O disagree about the thesis C. P defends this thesis by the argument A, therefore B, therefore C. Suppose that O would agree with B, but does not agree with A. Then A becomes an issue between P and O, although the debate might have been solved if the more complex argument had been split up into two arguments, B therefore C, and - only if B were questioned - A, therefore B. Since O would not have questioned B, P and Q would have reached agreement about C without having an issue left.<sup>22</sup>

Because of the purpose of the dialogues, the establishment of a set of premises, or rather the differences in the relevant premises that the parties are willing to accept, the dialogue rules are not aimed at defining logical operators. However, the rules of the Pleadings Game do reflect the defeasible nature of legal reasoning, and in that respect they are similar to the rules for dialectical approaches to defeasible reasoning.

The purpose of the Pleadings Game makes it differ from the work of Lorenzen and Lorenz and from static dialectical approaches in that the set of premises is not fixed and in that it is not necessary to survey the set of all possible arguments. The Pleadings Game is a mediating system rather than a conflict resolution system; it is left to the parties in a dialogue to establish about which premises they agree and about which they disagree. The validity of the arguments on the basis of these premises is left to the mediating system.

These characteristics make the Pleadings Game into a dynamic dialectical system. The dialogues take place, and are not merely simulated, during a process that stretches out in time, and it is non-deterministic in that the players are within certain confines free to introduce facts and rules into the dialogue. Only those argument moves are allowed in the Pleadings Game that are relevant from a logical point of view. All dialogue moves have a set of preconditions that are inspired by the logical status of the dialogue and the way in which the

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<sup>22</sup> Of course it remains open to O not to question A, because she agrees with B. Moreover, although it is not necessary, P might have split up his argument into two steps: B, therefore C, and A, therefore B, adducing the latter argument only if the former would have been attacked by O.

move changes this status. In other words, the procedural rules of the Pleadings Game by and large reflect the logic that underlies the game. Domain-related rules that impose additional constraints on the dialogue, such as the rules of legal justification and the obligatory legal forms of reasoning that were adopted by Alexy, are lacking. That is why I think that on the sliding scale from non-dialogical to dialogical dynamic systems, the Pleadings Game is relatively near the pole of non-dialogical systems.

## 7. The procedural and rhetorical nature of the law

In their paper *Hard Cases: A Procedural Approach*, Hage, Leenes and Lodder (1994) argued for a perspective on the dialectical approach in which dialogues do not only have a function in the establishment of premises, but also in the constitution of law in concrete cases. This perspective formed the starting point for the thesis of Lodder (Lodder 1998).<sup>23</sup> Two key ideas play a central role in this connection: the *purely procedural* nature of the law in concrete cases, and the *rhetorical* nature of this procedure.

The purely procedural nature of the law means that what is the law in a particular case is not something that is given independent of the procedure that leads to a decision about the law in a concrete case. This procedural nature is a direct consequence of the fact that the law in concrete cases is reason-based. There is no standard for the outcome of a legal case otherwise than that this outcome is the result of a rule-applying procedure.

Procedures can also play a role if there is an independent standard. In the presence of a standard, we can distinguish between perfect and imperfect procedures. Perfect procedures are guaranteed to lead to outcomes according to the standard. An example is to divide a cake in equal pieces by using a good scale to weigh the pieces. Imperfect procedures should also lead to outcomes in accordance with the standard, but they cannot guarantee the correctness of their outcomes. Criminal procedures, for instance, cannot guarantee that they will lead to the conviction of all, but only criminals. (Rawls 1972, pp. 85f.) Pure procedures do not have an independent criterion to measure their outcome against. Lotteries are examples of such pure procedures. Their outcome is correct if the correct procedure was followed, no matter the nature of the outcome.

The application of rules, legal rules included, is not merely a logical operation, but rather a kind of action that may or may not be performed (Hage 1997a, p. 123). There can be reasons against the application of a rule that are not mentioned in the conditions of the rule. For instance, a superior rule with an incompatible conclusion may be applicable. Whether a rule is actually applied depends not only on whether the conditions of the rule are satisfied, but also on whether exceptional circumstances are *known*. Exceptions that obtain, but are unknown, cannot influence the application of the rule, and the rule will be applied and will generate its legal consequence.

Moreover, the decision whether a rule is applicable to a concrete case depends on whether the case can be classified in terms of the rule conditions. This classification depends on classificatory rules, many of which are not given before the concrete case to which they are to be applied. For instance, the classification of illegally copying software as appropriating someone else's good may ask for a classificatory rule that was never formulated before. It depends on a concrete procedure whether such a rule is accepted as part of the law.

Clearly the actual procedure involved in the application of a rule is relevant for the legal consequences that hold in a concrete case. That is why there is no independent standard for the evaluation of legal conclusions, and why the law in concrete cases is purely procedural.

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<sup>23</sup> The logical systems presented in this paper and in Lodder's thesis reflect this theoretical position only to a limited extent, however.

The procedural nature of the law would not be important if the procedure could only have one outcome. If the facts and the law are fixed in a case, even if the available information is incomplete, the outcome of the law applying procedure might also be fixed.<sup>24</sup> However, the input of the procedure is not fixed. Rather is it the case that the law-applying procedure allows for both changes in the recognised facts and changes in the law. By producing a convincing argument (in the psychological sense) a dialogue party can add rules and/or exceptions to the available legal rules, with the effect that the same body of facts leads to more or less legal consequences. Similarly it is possible to change the body of available facts by changing the rules for classification and/or proof.<sup>25</sup>

This possibility of modifying the law during a procedure by convincing one's opponent defines the *rhetorical nature* of the law. The rhetorical nature of the law means that the procedure is concerned with convincing an audience of some thesis (about the outcome of a case). Conviction, in opposition to validity, depends on what actually happens. An audience can be convinced (persuaded some would say) by arguments that are not logically forcing, or that ultimately rest on premises that had not been accepted by the audience before the procedure. The procedural and the rhetorical nature of the law make that the legal consequences in a concrete case are whatever is the outcome of a correct procedure. *In this respect* the law in concrete cases is comparable to the outcome of a lottery.

The change of perspective that results from considering law as a pure rhetorical procedure has several implications. First, the procedural rules (dialectical protocols) become more important. The dialogue rules in systems that focus on the modelling of defeasible reasoning tend to be confined to ensuring that both parties have full opportunity to attack the arguments of their opponent. The ways in which attacks are made possible depends on the nonmonotonic logic that is modelled by the system. For instance, systems may allow questioning premises, adducing reasons against the application of a rule, or adducing reasons for an incompatible conclusion. In other words, the dialogue rules are strongly related to the logic they model.

If the emphasis shifts from modelling a nonmonotonic logic to the establishment of law in concrete cases, other procedural rules become important. An example is the exclusionary rule, which forbids adducing evidence in a criminal procedure that was obtained illegally. Another example, also from criminal law, is that arguments based on analogical rule application are forbidden (Kloosterhuis 1995). Even more fundamental is that in legal procedures, the parties are committed to the law, not only in the sense that they are forced to accept the valid rules of law, but also in the sense that they ought to apply these rules where relevant. In general it holds that if the function of a procedure is to establish the law, the nature of the procedure is not (primarily) a matter of logic, but it is a matter of law itself. In the following sections I will discuss some of the consequences of the shift from merely dynamic dialectical systems to law-establishing dialogue systems

## **8. The role of legal rules in law-establishing dialogues**

The idea that law is purely procedural is somewhat counter-intuitive, to say the least. Clearly there are some hard cases, the outcome of which is uncertain, and that can be argued in several ways. But just as clearly, there are cases about which every sensible lawyer will

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<sup>24</sup> This is the case if the procedure that leads from the facts and the law to the legal consequences in a concrete case allows no external influence on the outcome. An example of external influence that should be excluded is that dialogue parties only come up with the 'wrong' arguments.

<sup>25</sup> These a-rational aspect of legal argumentation are emphasised in Lodder 1998.

agree as to their legal solution. This strongly suggests that the law is not purely procedural, but rather has an imperfect procedure.

This line of reasoning is strengthened by the observation that a purely procedural view of the law leaves little room for the rules of law that apparently determine the legal consequences of concrete cases. If the parties to a dialogue are free, within the confines of the dialogue rules, to determine the outcome of the dialogue, how can the role of legal rules be accounted for?

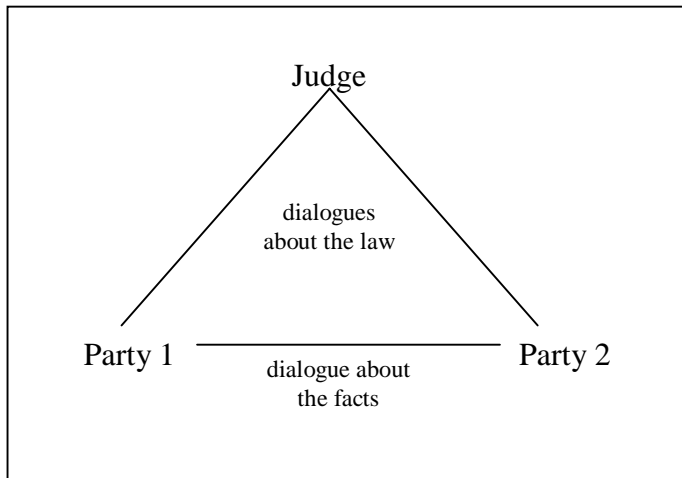
To meet these objections, I propose to distinguish between two views of purely procedural law. The one view, which seems wrong, is that the parties in a dialogue are completely free to use or not use the legal rules that are applicable to their case. According to this view, the dialogue rules leave the contents of the dialogue completely open. The other view, which is in my opinion correct, is that the rules of legal dialogues somehow force the parties in a dialogue to take the pre-existing legal rules into account. In the remainder of this section I will illustrate how dialogue rules might accomplish that.

First, I want to distinguish between civil cases in which parties are, at least according to Dutch law, to a large extent free to determine which facts will be taken into account, and, for instance, criminal cases, in which one of the purposes of the procedure is to find the truth. In civil cases, the facts are, so to speak, to the disposal of the parties, while the law is not. In criminal cases, neither the facts nor the law is at the disposal of the parties. Because in civil cases both phenomena - aspects that are, and aspects that are not at the disposal of the parties - play a role, I will continue my discussion with them. The part of the discussion devoted to the law in civil cases will *grosso modo* also be applicable to the law and the facts in criminal cases.

Since the parties in a dialogue are free to dispose of the facts of the case, precisely those facts are assumed to obtain that are accepted by both parties in the dialogue. The cause of this acceptance may be that some party is forced to accept (the absence of) certain facts as a consequence of her acceptance of other facts, of the burden of proof, or a decision of the arbiter (see section 10). Given these, sometimes severe, constraints, the facts of the case are the result of the dialogue between the parties and are not determined by independent law.

To account for the fact that the law is something that is, to some extent, given independent of what the dialogue parties want it to be, it is necessary to add a third party to the procedure. It will not do to add rules of law to the commitments of the dialogue parties, because if the parties do not use the rules to which they are committed, commitment to the law has few or no effects. It is crucial that somehow the application of valid rules of law is secured, and for this purpose an independent 'guardian of the law' is necessary. The role of the judge in actual legal procedures springs to mind as an example of such an independent guardian of the law. It is her task to apply the valid rules (and principles ..., etc.) of the law to the case at hand.

The role of this judge in legal procedures can be modelled as a third party in what now becomes a triologue. The triologue can in turn be modelled as three interrelating dialogues between the three parties involved in the procedure. See figure 6.



**Figure 6: A trialogue**

The two 'normal' parties have a dialogue about the facts of the case. The judge is committed to precisely those case facts to which both parties are, or become, committed. Moreover, both of the normal parties have a dialogue with the judge about the legal consequences of the case. The outcome of the trialogue consists of the commitments of the judge at the end of the procedure.

This sketch of trialogues leaves much to be specified. For instance, it must be defined how the three dialogues interrelate in time and in content. Moreover, it is still unclear how the judge must fulfil her task to safeguard the law. However, the sketch gives an impression how commitment to an independent law can be combined with a fully procedural view of the law.

Notice, by the way, how this trialogue model reflects a characteristic of civil law, namely that the parties to a civil dispute are free to dispose of their rights, including the right to enforce their legal position. If procedures are used to establish the law, the nature of the procedures must reflect the law and not only some system of logic. In the present example this is shown in the dialogue between the parties about the facts of the case, and the commitment of the judge to the facts about which the parties agree.

## **9. Reasoning about dialogue rules and dialogue moves**

A dialogue can be considered as a sequence of dialogue moves. Dialogues are regulated by a set of dialogue rules, which must fulfil several roles. Amongst these roles, two important ones are to determine which party can/may make which dialogue moves at which moment, and to determine which party is committed to which sentences, c.q. has won the dialogue. Rules that determine the commitments of the dialogue parties will reflect the logic that underlies the dialogue game. For instance, in Gordon's Pleadings Game, the commitment rules, which regulate the effects of dialogue moves, reflect Gordon's adapted version of conditional entailment.

The rules that determine which moves are possible at which moment may be influenced by the underlying logic too, but they can also to a large extent be determined by the domain of the dialogues, for instance by the law. I already mentioned rules that disallow to defend

claims by adducing illegally obtained evidence or by applying criminal laws analogously. Other feasible rules would be rules that forbid to question sentences that were decided upon by the arbiter (see section 10), or rules that confine the possibility of attacking claims in time. In theory, large parts of procedural law can be incorporated in the rules of some dialogue game.<sup>26</sup>

Because dialogue rules can to a large extent determine the outcome of dialogues, the rules for law-establishing dialogues will be specified by the law itself. Since every legal system has its own procedural rules, even several sets for different parts of the law, it seems hard to develop a general dialogical model for the establishment of the law. Nevertheless, it is possible to develop such a general model, by treating the dialogue rules as domain knowledge, and by modelling legal procedures by means of a kind of second-order rules. A dialogue move is on this view possible if it is explicitly made possible by a (domain dependent) dialogue rule to which both parties are committed. At the beginning of a dialogue, both parties are committed to a set of first-order dialogue rules that are part of the legal system in question. The second order rules that are incorporated in the dialogue system dictate that the possibility of making dialogue moves depends on the first-order dialogue rules.

This approach has the additional advantage that it becomes possible for the parties to debate on the first-order dialogue rules. These rules are rules of law, just like, for instance, rules of criminal law and of civil law. To some extent these rules may be subject of the dialogue of the parties, for instance in the form of a discussion about their interpretation, which can be seen as discussion about which rules are valid (Hage 1996, p. 258f.; Hage 1997a, p. 197f.). This means that the procedural rules are subject of the dialogue too. Because the procedural rules govern the dialogue, a dialogue can change its own rules.<sup>27</sup>

Not only the dialogue rules may be subject of the discussion; individual moves may be the topic of an argument, too. The possibility of arguing about individual dialogue moves is important for law-establishing dialogues, because the outcome of the dialogue counts as law. Allowing or disallowing a move may therefore make the difference between winning and losing a legal case. If a dialogue move is disallowed, this disallowance can take two shapes. First, it may be that a (computer-implemented) dialogue system ignores the move completely, except for sending a message to the party who made the move that the move was illegal. Severe violations of the dialogue rules, such as ignoring ones own commitments, should be treated in this way. Second, the dialogue system may 'allow' the move, which is then in some sense possible, but the other party may claim that the move was illegal.<sup>28</sup> If this claim is upheld, the illegal move will be ignored. For instance, if some party adduces illegal evidence, this move may be claimed to be illegal. If this claim turns out to be correct, the move in which the illegal evidence was adduced must be withdrawn.

## **10. The burden of proof and the role of the arbiter**

Since the parties in a legal procedure usually have opposing interests, there is a danger in allowing the parties to establish the facts of a case amongst themselves. The opponent of the claim with which the dialogue begins has an interest in denying everything the proponent claims and in opposing every attempt to get her committed to anything. The law knows several means to limit the effects of such a destructive strategy. The first means is to have

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<sup>26</sup> The PhD-research of Leenes deals amongst others with the legal constraints on dialogues.

<sup>27</sup> Vreeswijk 1995 described a way of modelling the change of dialogue rules during the dialogue.

<sup>28</sup> This distinction between impossible and illegal moves corresponds to the legal distinction between acts in the law that are void and that are voidable. The distinction is given explicit attention in Lodder 1998, pp. 50f.

initial commitments for both parties to some facts that are assumed by default, for instance facts that are generally known to obtain.

The second means is to assign the burden of proof for particular facts to one of the parties. By assigning some dialogue party a burden of proof, a default decision is made about the presence of facts: some facts are assumed (not) to obtain, unless the party that has the burden of proof proves otherwise. In this way it becomes possible to add facts so that the possibility arises to determine the legal consequences of the case.

The burden of proof may be more or less severe. Freeman and Farley (1996) distinguish five levels of support that can be given to a claim:

- \* *scintilla of evidence*, where there is at least one defensible argument for the claim
- \* *preponderance of evidence*, where there is at least one defensible argument that outweighs all arguments of the opponent for the opposite conclusion
- \* *dialectical validity*, where there is at least one credible, defensible argument for the claim, and where all arguments of the opponent for the opposite claim are defeated
- \* *beyond a reasonable doubt*, where there is at least one strong, defensible argument for the claim, and where all arguments of the opponent for the opposite claim are defeated
- \* *beyond a doubt*, where there is at least one valid, defensible argument for the claim, and where all arguments of the opponent for the opposite claim are defeated

Under which circumstances an argument is defensible, defeated, credible, strong, or valid, is defined on the basis of an underlying logical theory for which the reader is referred to (Freeman and Farley 1996).

Since the work of Freeman and Farley is based on a static dialectical theory, where the set of premises is fixed, their theory about the burden of proof does not help against an opponent who refuses to co-operate in establishing the facts. Although it specifies the amount of proof that is available given a set of premises, which is useful for a division of the burden of proof between the dialogue parties, it leaves the question open where the basic facts of the case, from which the other ones must be proven, come from.

Here is where the arbiter has her role.<sup>29</sup> She can make decisions about (factual) issues that bind upon the dialogue parties. Such a decision can be straightforward, when some fact is decided to obtain, whether the parties agree or not. It may also be somewhat more circumspect, such as when one of the parties is assigned to the burden to prove (the absence of) some facts.

The role of an arbiter is unavoidable in law-establishing dialogues.<sup>30</sup> It is, however, a problematic role, because a decision of the arbiter on an issue makes a dialogue about this issue superfluous. The idea of having an arbiter is against the very spirit of dialogue

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<sup>29</sup> To avoid misunderstandings, it may be useful to point out that the arbiter is not necessarily the same person as the judge who was introduced in the previous section in connection with legal issues. The roles of the arbiter and the judge are not the same. In actual legal procedures, the two roles tend to be merged in the person of the judge.

<sup>30</sup> In merely dialectical systems, an arbiter is superfluous, because if a claim cannot be proven, it is invalid. In systems as the Pleadings Game, the role of the arbiter only becomes important when the pleadings game has finished. The arbiter may have to decide about the remaining issues. Gordon assigns this function of the arbiter to the Trial Game.

games.<sup>31</sup> Nevertheless, arbiters are unavoidable, and the best way to cope with them is to limit their role. How this should be done is beyond the scope of this paper.<sup>32</sup>

## 11. Mediating systems

If the law is seen as having a rhetorical nature, the natural role for dialogical systems is that they support legal dialogues, rather than evaluate them as to their rationality. Systems that fulfill such a supporting role are called 'mediating systems'. In the recent literature on Artificial Intelligence and Law, three such mediating systems have been proposed. One of them is the ZENO argumentation framework by Gordon and Karacapilidis (1997), another one the Room 5 system by Loui et al. (1997), and the third one is the DiaLaw system by Lodder (1998).

The ZENO argumentation framework makes use of a discussion model that contains messages that are exchanged by the participants in a discussion. The contributions to the discussion can be given informally, and are interpreted and formalised by a human mediator. The results of this interpretation and formalisation are called marked messages. These are stored in the discussion model.

The content of the discussion model can be modelled as a dialectical graph. In such a graph, the positions of the different parties in the discussion and the support and attack relations between them are modelled in the form of a tree. The root of the tree represents the issue at stake, and the branches indicate lines of argumentation leading to different solutions for the issue.

Given such a tree it is possible to define several levels of support for the solutions to the issue. Gordon and Karacapilidis distinguish five such levels, that is *scintilla of evidence*, *preponderance of the evidence*, *no better alternative*, *best choice*, and *beyond a reasonable doubt*.<sup>33</sup> Positions taken by the parties are labelled as *in* or *out*, depending on whether they meet the level of proof that is selected for the issue. For instance, there is a *scintilla of evidence* for a particular position if there is at least one position, labelled as *in*, which supports the position at stake.

The Room 5 system by Loui et al. is similar to the ZENO-system in that it provides an environment for humans to conduct structured legal discussions. Its logical support is somewhat less than that of ZENO, but this is compensated by a facility for retrieving federal decisions on past cases.

Where the ZENO argumentation framework supports decision making processes in general, Lodder's DiaLaw aims at characterising legal justification. A legal solution for a case is justified if the parties in a legal dialogue reach an agreement about this solution. The DiaLaw system supports legal dialogues by enforcing the dialogue protocol and by keeping track of the commitments of the parties in the dialogue.

The DiaLaw system is a strongly improved, and implemented version of the dialogical variant of reason-based logic that was proposed in Hage et al. 1994. As a consequence, it has reason-based logic (Verheij 1996, Hage 1996 and 1997) as its underlying logic. This logic is not used, however, to evaluate the validity of arguments proposed by the dialogue

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<sup>31</sup> For this reason, the role of the arbiter is not implemented in Lodder's DiaLaw system. See Lodder 1998, p. 29.

<sup>32</sup> In Hage et al. 1994 the proposal was made to allow a call to the arbiter only if there is no winning strategy for or against the issue at stake. This limitation of the role of the arbiter does not go far enough, because it allows a call to the arbiter at the beginning of almost every dialogue about the facts of a case.

<sup>33</sup> As these alternatives suggest, the ZENO framework uses results from the work of Freeman and Farley (1996) to define the level of support or positions.



parties, but rather to enable one party in a dialogue to force his opponent to accept what he was logically already committed to.

In fact, it is one of Lodder's main claims that moves in dialogues need not lead to arguments that are valid according to some system of logic (Lodder 1997 and 1998). Let me use an example to illustrate this. Suppose that A has the position that O.J. murdered his wife. When challenged to defend this position, he adduces the argument that O.J. was found next to his wife's body with a smoking gun in his hand. If this argument is accepted as providing sufficient support, A's position that O.J. murdered his wife counts as justified, despite the fact that there is no 'logical' relation between the positions that O.J. was found next to his wife's body with a smoking gun and that he murdered his wife.

Although justifying arguments need not be logically valid, logic plays a role in DiaLaw through the mechanism of forced commitment. If A's opponent has accepted that O.J. was found with a smoking gun and he has also accepted the rule of evidence that if somebody is found with a smoking gun next to a corpse, the person with the gun may be assumed to have committed the murder, he must accept that O.J. committed the murder, unless he can justify the position that there is an exception to the rule.

The ZENO framework, the Room 5 system, and DiaLaw have in common that they support human discussants by structuring their discussion and by providing logical tools to maintain a minimum level of rationality. They differ from systems as proposed by Loui and Norman (1995), and Prakken and Sartor in that their purpose is not to provide a standard for the evaluation of the rationality of a dialogue, but rather to support discussants in having a rational dialogue. Although these purposes are not in opposition, there is a shift in emphasis that places ZENO, Room 5, and DiaLaw nearer to the dialogical pole on the gliding scale from dialectics to dialogues.

## 12. Concluding observations

When the several systems for legal dialectics and dialogues are compared, it is possible to make a number of distinctions. In the course of this paper I have mentioned a number of systems, without mentioning whether they were implemented or not. In fact, most of the mentioned systems are logical systems, which give a dialectical characterisation of logical consequence. The Pleadings Game, ZENO, Room 5, and DiaLaw, however, are computational systems.

A second distinction is the one between conflict resolution systems and mediating systems. Logical issues, if cast in a dialectical form, become a kind of conflicts. The systems of Lorenzen and Lorenz, and those of the battle of argument-theoreticians, are systems that decide how these conflicts are to be resolved. Mediating systems, on the contrary, do not resolve conflicts. They rather help humans to solve their conflicts themselves, by providing an environment for structured discussion (Gordon and Karacapilidis 1997).

Another distinction is also based on the function of the systems. Some systems are intended to give a dialectical characterisation of a particular form of logic. The system of Lorenzen and Lorenz, to take a typical case, aims at a dialectical characterisation of intuitionistic logic. The battle of arguments-theorists (e.g. Prakken and Sartor) aim at the characterisation of nonmonotonic logics. Other systems aim at the establishment of the premises of legal arguments either as a basis for legal justification (Alexy, Aarnio, Peczenik,), or as identification of the issues between parties in a legal debate (Gordon). Battles of arguments can also be used to model some form of bounded rationality (Loui and Norman). Finally, there are systems the purpose of which is to determine the law in actual cases (Hage, Leenes and Lodder).

A fourth distinction is the one between static and dynamic systems. Mediating systems are by nature dynamic ones, but not all dynamic systems are mediating systems. For instance, the 1995 system of Loui and Norman works with argument stages, and is in that sense dynamic. Nevertheless, it operates with a fixed set of premises, which is atypical for dynamic systems. It is in a sense intermediate between static systems and mediating systems.

Verheij's CumulA (Verheij 1996) is dynamic in that both the set of premises and the set of arguments can change in time. It is not a mediating system, first because it is not implemented, and second because it has no dialogue protocol that specifies how the sets of premises and arguments may change.

All of these systems deal with some form of rationality. A major dividing line between them can be based on the question what kind of rationality they aim to model. Some systems deal with the rationality of argument *forms*. The work of Lorenzen and Lorenz, and the battle of arguments-theories, falls in this category. These systems typically assume a fixed set of premises, and regard all possible arguments based on these premises. The question with which they deal is whether some conclusion follows from the premises, and this is the case if, in a dialectical setting, there is a winning strategy to defend the conclusion. Actual dialogues, for which human players are needed who must make choices between several possible dialogue moves, do not play a role in this connection. These are the systems that I called non-dialogical.

Other systems deal with the rationality of the outcome of dialogues. They are concerned with content, not merely with form. Typically they do not assume a fixed set of premises; the rationality of the outcome depends in part on the way in which the premises of the argument were established. They do not consider all possible arguments, but are rather concerned with actual dialogues that lead to a particular conclusion. For this reason, the systems cannot provide the dialogue moves themselves, but depend on human players. Implementations of such systems will be mediating systems, rather than reasoning systems. These are the systems that I called dynamic dialectical.

The category of dynamic systems can be subdivided into logic-related systems and law-related systems, although I want to emphasise that this distinction is a matter of degree. Logic-related systems have dialogue rules that reflect primarily the logic that underlies the dialogue system. Notice that all dialogue systems that have anything to do with reasoning must have some underlying logic and that the dialogue rules of such systems must reflect these underlying logics. For some systems it holds that almost all dialogue rules reflect the underlying logic, and that there are few other rules. The Pleadings Game of Gordon fall in this category. The law-establishing systems (Hage, Leenes, Lodder) must incorporate legal rules in the dialogue rules, because otherwise the outcome of the dialogues could not be called law.

Law-establishing systems must both make sure that the dialogues take the law into account, and that the dialogues are not frustrated by a non-cooperating party. To accommodate for these needs, the roles of a judge and of an arbiter are introduced in the dialogue game. These introductions change dialogues into procedures that involve more parties.

The following schema gives an overview of some of the distinctions made above:

<b>SYSTEMS WITH FIXED PREMISES</b> (deal with rationality of form)		<b>SYSTEMS WITH DYNAMIC PREMISES</b> (deal with rationality of content; mediating systems)	
<b>Static dialectical systems</b>  (deal with full rationality)	<b>Non-dialogical dynamic systems (1)</b>  (deal with bounded rationality)	<b>Non-dialogical dynamic systems (2)</b>	<b>Dialogical systems</b>  (law-establishing dialogs)
Systems that consider all possible arguments given some logic	Systems that consider only arguments that were actually adduced	Systems with a dialogue protocol that is largely logic-based	Systems with a dialogue protocol that is also domain-based
a. Lorenzen and Lorenz (1978)  b. Prakken and Sartor (1996)	a. Loui and Norman (1995)  b. Prakken (1995)	a. Gordon's Pleadings Game(1994/5)  b. Hage, Leenes and Lodder (1994), the formal part  c. Verheij's CumuLA (1996)  d. Lodder's DiaLaw (1995, 1998)	a. Alexy's Theorie der juristischen Argumentation (1978)  b. Hage, Leenes and Lodder (1994), the informal part

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## REFERENCES

- Aarnio, A. (1987). *The Rational as Reasonable. A Treatise on Legal Justification*. D. Reidel Publishing Company, Dordrecht.
- Aarnio, A., R. Alexy and A. Peczenik (1981). The Foundations of Legal Reasoning. *Rechtstheorie* 12, pp. 133f, 257f, and 423f.
- Albert, H. (1968). *Traktat über kritische Vernunft*, Siebeck, Tübingen.
- Aleven, V. (1997). Teaching case-based argumentation through a model and examples. PhD-thesis Pittsburgh.
- Alexy, R. (1978). *Theorie der juristischen Argumentation*. Suhrkamp Verlag, Frankfurt am Main.
- Anscombe, G.E.M. (1958). On Brute Facts, *Analysis*, vol. 18, pp. 69-72.
- Ashley, K.D. and E.L. Rissland (1987). But, See, Accord: Generating Blue Book Citations in HYPO, *Proceedings of the First International Conference on Artificial Intelligence and Law*, ACM, New York, pp. 67-74.
- Ashley, K.D. (1991). Reasoning with cases and hypotheticals in HYPO. *International Journal of Man-Machine Studies*, vol. 34, pp. 753-796.
- Barth, E.M. and Krabbe, E.C.W. (1982). *From Axiom to Dialogue*. Walter de Gruyter, Berlin, New York.
- Bench-Capon, T.J.M. (1997). Arguing with cases. A. Oskamp et al. eds., *Legal knowledge based systems; Jurix: The Tenth Conference*, pp. 85-100.
- Bench-Capon, T.J.M., P.E.S. Dunne and P.H. Leng (1992). A dialogue game for dialectical interaction with expert systems. *Proceedings of the 12th Expert Systems Conference*, Avignon.
- Devitt, M. (1991). *Realism and Truth*, 2nd edition, Basil Blackwell, Oxford.
- Dung, P.M. (1995). On the acceptability of arguments and its fundamental role in nonmonotonic reasoning, logic programming and n-person games. *Artificial Intelligence* 77, number 2, pp. 321-357.
- Feteris, E.T. (1994). Redelijkheid in juridische argumentatie. (Rationality in legal argumentation) Tjeenk Willink, Zwolle.
- Freeman, K. and A.M. Farley (1996). A Model of Argumentation and Its Application to Legal Reasoning. *Artificial Intelligence and Law*, vol. 4 no. 3/4. pp. 163-197. Also in H. Prakken and G. Sartor (eds.), *Logical Models of Legal Argumentation*. Kluwer Academic Publishers, Dordrecht 1997.
- Geffner, H. and J. Pearl (1992). Conditional entailment: bridging two approaches to default reasoning, *Artificial Intelligence* 53, pp. 209-244.
- Gordon, Th. F. (1991), An abductive theory of legal issues, *International Journal of Man-Machine Studies*, vol. 35, pp. 95-118.
- Gordon, Th. F. (1994), The Pleadings Game: An Exercise in Computational Dialectics, *Artificial Intelligence and Law* 2, pp. 239-292.
- Gordon, Th. F. (1995), *The Pleadings Game, An Artificial Intelligence Model of Procedural Justice*, Kluwer Academic Publishers, Dordrecht.
- Gordon, Th. F. and N. Karacapilidis (1997), The Zeno Argumentation Framework. *Proceedings of the Sixth International Conference on Artificial Intelligence and Law*. ACM, New York, pp. 10-18.
- Habermas, J. (1973), Wahrheitstheorieën. H. Fahrenbach (ed.) *Wirklichkeit und Reflexion, Festschrift, für W. Schulz*, Pfullingen, pp. 211-265.

- Hage, J.C. (1987). *Feiten en betekenis. Een verhandeling over ontologie en praktische rede. (Facts and Meaning; a treatise on ontology and practical reason.)* PhD-thesis Leiden.
- Hage, J.C. (1993). Monological Reason Based Logic. *Proceedings of the Fourth International Conference on Law and Artificial Intelligence*, ACM-press, New York, pp. 30-39.
- Hage, J.C. (1996). A Model of Legal Reasoning and a Logic to Match. *Artificial Intelligence and Law*, vol 4, nos. 3-4 (1996), pp. 199-273. Also in H. Prakken and G. Sartor (eds.), *Logical Models of Legal Argumentation*, Kluwer Academic Publishers, Dordrecht, pp. 43-117.
- Hage, J.C. (1997a). *Reasoning with rules*, Kluwer Academic Publishers, Dordrecht.
- Hage, J.C. (1997b). Legitimatietheorieën. (Theories of legitimation) in P.B. Cliteur, B.C. Labuschagne en C.E. Smith, *Rechtsfilosofische stromingen van de twintigste eeuw*. Gouda Quint, Deventer 1997, pp. 243-282.
- Hage, J.C., Span, G.P.J. and Lodder, A.R. (1992), A Dialogical Model of Legal Reasoning, in Grütters, C.A.F.M., J.A.P.J. Breuker, H.J. Van den Herik, A.H.J. Schmidt, and C.N.J. de Vey Mestdagh (eds.), *Legal Knowledge Based Systems: Information Technology and Law, JURIX '92*, Koninklijke Vermande, Lelystad.
- Hage, J.C., R. Leenes, and A. Lodder (1994). Hard cases; a procedural approach. *Artificial Intelligence and Law*, vol. 2, pp. 113-167.
- Hamblin, C.L. (1970). *Fallacies*. Methuen, London.
- Kaptein, H. (1995). The redundancy of precedent and analogy. Or Eat s\*\*t, five billion flies can't be wrong. F.H. van Eemeren et al. eds., *Proceedings of the Third ISSA Conference on Argumentation*, vol. IV, Special Fields and Cases, pp. 122-137. Amsterdam, Sic Sat.
- Kloosterhuis, H. (1995). The study of analogy argumentation in law: four pragma-dialectical starting points. F.H. van Eemeren et al. eds., *Proceedings of the Third ISSA Conference on Argumentation*, vol. IV, Special Fields and Cases, pp. 138-145. Amsterdam, Sic Sat.
- Larenz, K. (1983). *Methodenlehre der Rechtswissenschaft*, 5th ed., Springer Verlag, Berlin.
- Leenes, R.E., A.R. Lodder, and J.C. Hage (1994). A Dialogue Game for Legal Arguments. *Law, Computers & Artificial Intelligence*, vol. 3, nrs. 2/3, pp. 211-226.
- Lehrer, K. (1990). *Theory of Knowledge*. Routledge, London.
- Lodder, A. (1997). Procedural arguments. A. Oskamp e.a. (eds.), *Proceedings of the Tenth Jurix Conference*, Amsterdam 1997, pp. 21-32.
- Lodder A. (1998). *DiaLaw. On Legal Justification and Dialog Games*. PhD-thesis Maastricht.
- Lodder, A. and A. Herczog (1995), DiaLaw: A Computational Framework for Dialectical Reasoning. *Proceedings of the Fifth International Conference on Artificial Intelligence and Law*, pp. 146-155.
- Lorenzen, P. and Lorenz, K. (1978). *Dialogische Logik*, Wissenschaftliche Buchgesellschaft, Darmstadt.
- Loui, R.P. (1987). Defeat among arguments: a system of defeasible inference. *Computational Intelligence 2*, pp. 100-106.
- Loui, R.P. and J. Norman (1995). Rationales and Argument Moves. *Artificial Intelligence and Law* vol. 3, no. 3, pp. 159-189.
- Loui, R.P. et al. (1997). Progress on Room 5. *Proceedings of the Sixth International Conference on Artificial Intelligence and Law*, pp. 207-214. ACM, New York.

- MacCormick, D.N. (1978). *Legal Reasoning and Legal Theory*, Clarendon Press, Oxford.
- MacCormick, D.N. and O. Weinberger (1986), *An Institutional Theory of Law*, Reidel, Dordrecht e.a.
- Nitta, K., S. Wong, and Y. Othake (1993). A Computational Model for Trial Reasoning. *Proceedings of the Fourth International Conference on Artificial Intelligence and Law*, ACM Press, pp. 20-29.
- Nitta, K., M. Shibasaki, T. Sakata, T. Yamaji, W. Xianchang, H. Ohsaki, S. Tojo, I. Koku-bo and T. Suzuki (1995). New HELIC-II: A Software Tol for Legal Reasoning, *Proceedings of the Fifth International Conference on Artificial Intelligence and Law*, pp. 287-296.
- Peczenik, A. (1989). *On Law and Reason*, Kluwer Academic Publishers, Dordrecht.
- Perelman, Ch. and Olbrechts-Tyteca, L. (1969). *The New Rhetoric; a Treatise on Argumentation*. University of Notre Dame Press, Notre Dame.
- Pollock, J.L. (1987). Defeasible Reasoning. *Cognitive Science* 11, pp. 481-518.
- Pollock, J.L. (1994). Justification and defeat, *Artificial Intelligence* 67, pp. 377-407.
- Popper, K.R. (1972). *The Logic of Scientific Discovery*, Hutchinson, London.
- Prakken, H. (1993). *Logical tools for modelling legal argument*, PhD-thesis, Amsterdam.
- Prakken, H. (1995). From Logic to Dialectics in legal Argument. *Proceedings of the Fifth International Conference on Artificial Intelligence and Law*, ACM, New York, pp. 165-174.
- Prakken, H. (1997). *Logical Tools for Modelling Legal Argument. A Study of Defeasible Reasoning in Law*. Kluwer Academic Publishers, Dordrecht e.a.
- Prakken, H. and G. Sartor (1996). A Dialectical Model of Assessing Conflicting Arguments in Legal Reasoning. *Artificial Intelligence and Law*, vol. 4 no. 3/4. pp. 331-368. Also in H. Prakken and G. Sartor (eds.), *Logical Models of Legal Argumentation*. Kluwer Academic Publishers, Dordrecht 1997.
- Prakken, H. and G. Sartor (1997). Reasoning with Precedents in a Dialogue Game. *Proceedings of the Sixth International Conference on Artificial Intelligence and Law*, pp. 1-9. ACM, New York.
- Rawls, J. (1972). *A Theory of Justice*, Oxford University Press, Oxford.
- Rissland, E.L., D.B. Skalak, and M.T. Friedman (1996). Bank XX: Supporting Legal Arguments through Heuristic Retrieval, *Artificial Intelligence and Law* vol. 4 nr. 1, pp. 1-71.
- Ruiter, D.W.P. (1993) *Institutional Legal Facts. Legal Powers and their Effects*. Kluwer Academic Publishers, Dordrecht.
- Sartor, G. (1994). A Formal Model of Legal Argumentation. *Ratio Juris*, vol. 7, pp. 177-211.
- Schwemmer, O. and P. Lorenzen (1973). *Konstruktive Logik, Ethik und Wissenschaftstheorie*. Mannheim.
- Searle, J. (1995). *The construction of social reality*. The Free Press, New York.
- Skalak, D.B. and Rissland, E.L. (1991). Argument Moves in a Rule-Guided Domain. *Proceedings of the Third International Conference on Artificial Intelligence and Law*, ACM, New York, pp. 1-11.
- Skalak, D.B. and Rissland, E.L. (1992). Arguments and Cases: An Inevitable Intertwining. *Artificial Intelligence and Law*, vol 1 nr. 1, pp. 3-44.
- Verheij, Bart (1996). *Rules, Reasons, Arguments. Formal studies of argumentation and defeat*. PhD-thesis Maastricht.
- Vreeswijk, G.A.W. (1993a) *Studies in Defeasible Argumentation*. PhD-thesis, Amsterdam.

Vreeswijk, G.A.W. (1993b) Defeasible Dialectics: A Controversy-Oriented Approach to Defeasible Argumentation, *The Journal of Logic and Computation*, vol. 3 no. 3. Also in G.A.W. Vreeswijk, *Studies in Defeasible Argumentation*. PhD-thesis, Amsterdam 1993.

Vreeswijk, G.A.W. (1995). *Representation of Formal Dispute with a Standing Order*. Technical Report MATRIKS, Maastricht University, Dept. of Computer Science. Also in this volume.