Argumentation Methods
for Artificial Intelligence in Law

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With 28 Figures

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For Karen
With Love

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Introduction

During a recent visit to China to give an invited lecture on legal argumentation I was asked a question about conventional opinion in western countries. If legal reasoning is thought to be important by those both inside and outside the legal profession, why does there appear to be so little attention given to the study of legal logic? This was a hard question to answer. I had to admit there were no large or well-established centers of legal logic in North America that I could recommend as places to study. Going through customs in Vancouver, the customs officer asked what I had been doing in China. I told him I had been a speaker at a conference. He asked what the conference was on. I told him legal logic. He asked whether there was such a thing.[1] He was trying to be funny, but I thought he had a good point. People will question whether there is such a thing as "legal logic", and some recent very prominent trials give the question some backing in the common opinion. But having thought over the question of why so little attention appears to be given to legal logic as a mainstream subject in western countries, I think I now have an answer. The answer is that we have been looking in the wrong place. We have traditionally looked to formal deductive and inductive models of legal reasoning, and the results, while far from insignificant, especially as a starting point, have just not taken us far enough to deal effectively with the kind of reasoning that is fundamental to law. This is defeasible reasoning, the kind of reasoning in which a rule or generalization that is subject to exceptions is applied to a single case, producing a plausible inference that can fail in some cases, yet can still provide evidence to support a conclusion.

This book moves to a different model, and a different set of methods, that show great promise in dealing more effectively with defeasible reasoning. In this book, tools for argument analysis and evaluation that have been developed in informal logic and refined in artificial intelligence are applied to some central problems of defeasible reasoning in law. These methods were originally developed in argumentation studies and informal logic in order to provide tools to help students think more critically, for example when trying to analyze and evaluate controversial arguments of the kind typically studied in a philosophy course. They proved to be especially successful in analyzing arguments of the kind associated with traditional informal fallacies, like appeal to expert opinion. Such arguments were problematic in the past because they are defeasible, and thus prone to failure in some

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[1] The question can be taken in various ways. It could be taken as suggesting that the kind of argumentation used in trials, especially famous ones reported in the press, is not logical. This could be taken as a negative comment on the current state of law, or even on the methods used by trial lawyers. On the other hand, there is a legal tradition that there is no such thing as legal logic. Thayer (1889, p. 142) suggested that there are no special rules of logical inference unique to law when he wrote, "there is no law for reasoning other than what is found in the laws of thought". Thus the phrase 'legal logic' may seem to be an oxymoron even to many lawyers and judges.

instances, even though they can provide support for a conclusion in other instances. Meantime, the field of computing, especially artificial intelligence, became centrally preoccupied with such defeasible arguments. Hence the next development was that some in the computing field started to take an interest in these new methods, and to start trying to refine them into forms precise enough that they could help with problems in artificial intelligence. This synergy between the two fields led to collaboration and cross-fertilization of results. Now artificial intelligence is regarded as the main area of application of argumentation theory.

This book proceeds with the hypothesis that the next most important test bed for argumentation is legal reasoning. Argumentation is based on a pragmatic approach in which the use of an argument is studied in a dialogue context. An argument is seen not just as an arbitrarily selected set of premises and a single conclusion, but also as taking part in an orderly conversational exchange between two parties in which one is offering reasons to support a conclusion the other has doubts about, or needs to be convinced to accept. This approach sees an argument not only as a set of propositions, but as such a set used for some purpose in a dialogue context. Thus the approach can be called pragmatic in that it sees an argument as used in some context. This approach can be immediately seen to fit legal argumentation naturally and extremely well, if one thinks of the kind of argumentation typically found in a trial setting. There are two sides, there is a conflict of opinions, and each of them presents arguments to support its side and raise doubts about the argument put forward by the other side. Of course, there is more going on in a trial than this. There are many participants and there are specific procedural rules that vary from one jurisdiction to another. Still, once you start to think of it, law is a natural and highly promising field for the pragmatic approach to argumentation. Not only does law stand to profit greatly from this new approach, but the field of argumentation can find lots of highly interesting and important examples and case studies of arguments, like those found in famous trials.

Following up this line of thinking, I ventured to write a pioneering book (Walton, 2002) that tried the experiment of applying argumentation tools then being developed to a central field of law, that of evidence. Although legal reasoning had often been thought important as a field of study, especially as applied to rules of evidence, this field had never seemed to attain much status, or come up with important results, in the way, for example, social studies of witness testimony had done. Wigmore diagrams have never been fashionable in law, despite Wigmore's status as a scholar of evidence in law, and deductive and inductive models of argument, the dominant ones in logic for so long, didn't apply to legal reasoning in a way that was turning out to be all that useful in leading to powerful techniques for the evaluation of evidence. The wave of unjust conviction cases led some critics to conclude that evidence law was "adrift" (Damaska, 1997). The entry point for argumentation was this central notion in law that at trial evidence is admitted as relevant and then evaluated through the trial process. These methods were under development both in artificial intelligence and argumentation research, during and after the period the book (Walton, 2002) was being written and published. These new developments have advanced the analysis of legal argumentation in several ways indicated by the topics covered in this book.

One tool is a set of argumentation schemes representing common forms of argument that are presumptive and defeasible. A second is the software system *Araucaria* for argument diagramming that enables a user to mark up and save a diagram displaying a chain of reasoning in a case. The third tool is the classification system for different types of dialogue in which argumentation is commonly put forward. Chapter 1 introduces these methods and shows how to apply them to typical cases of legal argumentation of the kind common in evidence law. Chapter 2 goes on to show how the role of generalizations in reasoning in evidence law can be analyzed using these new tools. Suppose a suspect is charged with theft, and the police search his apartment. Among his possessions is found an unusual object that can be positively identified as the one stolen. Such a finding constitutes legal evidence, a kind of evidence based on an inference that is, in turn, based on a generalization. The generalization asserts that any item found in the possession of a theft suspect that appears to be the same as the one stolen is evidence that the suspect stole it. Generalizations of this kind support inferences that are extremely common in legal argumentation, especially in evidence law.

In chapter 3, the same tools are applied to the problem of analyzing and evaluating defeasible arguments of the kind so often used as evidence in law. One such tool is the argumentation scheme, which represents the form of a defeasible argument, and is accompanied by a set of appropriate critical questions. The schemes studied include argument from witness testimony, argument from expert opinion, argument from ignorance, and abductive reasoning. It is shown how defeasible arguments are best analyzed in a dialogue model of rational argumentation, of the kind used in logic to study fallacies, and now used to study legal argumentation in the new field of computational dialectics, a branch of artificial intelligence. According to Lodder (2000, p. 255), the term 'computational dialectics' first appeared when Ron Loui and Tom Gordon organized an AAAI workshop with Johanna Moore and Katya Sycara under the name Computational Dialectics in Seattle in 1994. The call for papers for the workshop (Loui and Gordon, 1994) described the field of computational dialectics as the study of structured dialogues used in multi-agent communication systems in which agents reach agreement to achieve common goals through rational interaction leading to an outcome in a fair and effective way. Such dialogues contain a blend of adversarial argumentation, so that each agent has an individual goal, and is an advocate, but at the same time the procedure is collaborative and works only because the agents also share a common goal. Thus the workshop invitation used the expression "communal standards" when describing such computational models of deliberation, negotiation and discussion.

The problem of epistemic closure is that of finding the criterion for closing a search in a knowledge base so a conclusion can be drawn that has been established by the evidence found. Sometimes not finding anything after such a search can represent evidence. Paradoxically, the lack of evidence found is a sort of evidence. In such cases, a failure to find some proposition in a knowledge base is a premise supporting an argument that the proposition sought for is false. In chapter 3, the problem of how to identify and evaluate lack of evidence arguments of this form is studied, and linked to the problem of epistemic closure, with special reference to

legal argumentation and burden of proof. It is argued that a proper evaluation of such arguments needs, in addition to a consideration of the semantic form of the argument, a consideration of its dialectical context, representing the stage of progress of an investigation towards closure.

Relevance is a central concept in trial rules used to ensure that a trial introduces and sticks to the right kind of evidence needed to bring the trial to a successful outcome of resolving the conflict of opinions that set it into motion in the first place. In chapter 4, argument diagramming is used to provide a model of relevance of the kind defined in Rule 401(a) of the Federal Rules of Evidence. By assigning values to the nodes in the diagram, the method is extended so that it represents probative weight of evidence, a notion central to the definition of relevance given in the Federal Rules. But the notion of relevance has always been highly problematic and elusive in the past. One of the central and most puzzling enigmas is the notion of conditional relevance. This notion means that an item of evidence can be introduced even if it is not relevant yet in the trial, at the stage reached so far, but it may become relevant at some future point as more and more evidence is presented. This notion has always been puzzling and controversial, as it seems to give a lawyer a kind of blank check to promise he will show something is relevant later on. Even so, sometimes using the notion of conditional relevance can help to move a trial along. But how could such a notion be defined, logically speaking? In chapter 4, the two techniques of the argument diagram and the framework of dialogue are combined to provide an analysis of the concept of conditional relevance.

Use of argumentation methods applied to legal argumentation is a relatively new field of study. Many vitally important problems of evidence in law can be formulated in light of these new methods, and even if these problems cannot be solved within the scope of any single monograph on the subject, some indications can be given on which direction for further research to take. Chapter 5 is a survey of several of these leading problems, with brief indication of how future research using argumentation-based methods might proceed. One set of problems concerns the analysis of different kinds of evidence that are mainly used in law – witness testimony, circumstantial evidence, forensic evidence and character evidence are all included. Two new tools for analyzing these kinds of evidence are introduced – abductive reasoning and examination dialogue. In the last section, a summary is given of the general methodology of how to evaluate evidence.

The next new tool introduced is a dialectical theory of explanation, an essential component in analyzing abductive reasoning as inference to the best explanation. This view of explanation has been tacitly adopted in many fields of AI for some time now, especially in expert system and planning technology. Only recently it has been formulated as a precise model (Walton, 2004, 2004a). This new dialectical model of explanation presented in chapter 6 analyzes the structure of an explanation as based on an inference or chain of reasoning typically composed of several inferences connected together. Different kinds of inference can be involved, deductive or inductive, but in many cases they are defeasible inferences based on generalizations of the kind studied in chapter 2 that are neither universal nor inductive. The chain of reasoning makes up an account, a connected network of inferences visualized by the diagramming software tool *Araucaria*. As well as being

inferential, or reasoning-based, in this sense, the new dialectical model is also pragmatic, in that it portrays the chain of reasoning on which an explanation is based as having a direction and aim. Each agent can possess something, or fail to possess something, called understanding. The aim of an explanation is for one agent to verbally transfer understanding to another, fulfilling the so-called clarifying function of discourse. Thus explanation is seen on the new theory as speech act in a dialogue. The questioner asks a question that indicates he can't make sense of something and the respondent gives an account of it that answers the question, thus helping him to make sense of it by filling in the right gaps in a chain of reasoning.

The problems cited in chapter 5 are in reach of being solved with further work, but in chapter 7 a very interesting and challenging problem is posed that represents work far in the future. This is the problem of constructing a device to aid in the invention of new arguments to prove or argue for a conclusion. Invention has long been a tool wished for in the field of rhetoric, and it would certainly be an extremely useful tool for trial lawyers. It would be a wonderful tool to have, but we are still quite a long way from getting it. Still, the methods applied in the previous chapter do show quite well, in outline, how such a tool could be constructed by building on the other methods. The problem is whether automated systems for argument diagramming applied to legal argumentation, fitting with Wigmore-style diagrams as devices helpful for marshaling evidence, can also be applied to the task of inventing new arguments. It is argued that legal argumentation is a good venue for investigating the question and that the notion of relevance is the key to finding a method of invention useful for legal argumentation.

Even though discussing how to build such a tool remains speculative at present, the idea of having it is so compelling and motivating that it is worth discussion as the final chapter of the book. An automated tool for inventing new arguments is something worth thinking about, even if the project of building it is only a goal that can be reached once the other methods of the previous chapters have been further refined and tested.

Thus an answer to the skeptical customs officer's question of whether there is such a thing as legal logic is provided by this book, or at least a new and promising avenue for getting an answer is opened up. The answer is that legal logic is an informal logic of a kind that models defeasible reasoning, seeing it not as imperfect or fallacious deductive or inductive reasoning, but as a distinctive third type of reasoning. Even though it is fallible, and can be fallacious in some instances, in other instances, it can be used to support a conclusion in such a way that it provides legal evidence for it, even though there may be other legal evidence against it as well. How should such evidence be evaluated? This book does not provide final answers of a kind that, at one shot, makes further investigation into the subject of legal logic unnecessary. Still, by providing tools that can be applied to this problem, and many other central problems of legal reasoning, it offers a new approach that those who wish to study reasoning can take to pursue the objective of developing a working legal logic that deals effectively with legal reasoning.

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