Argumentation and Theory of Evidence

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The purpose of this paper is to present some new methods widely in use in argumentation theory and informal logic that have applications to the theory of evidence in law. In recent years, a new pragma-dialectical approach¹ to argumentation, along with developments in the analysis of logical fallacies² and dialogue logic,³ has forged these methods together into a single new approach to the evaluation of arguments. This new approach expands the traditional focus of logic on deductive and inductive arguments. It enables a critic to evaluate an argument with respect to how it was used for some communicative purpose in a given case. Research efforts by legal scholars have already been made to applying this new approach to legal argumentation and evidence.⁴ In this paper, a general overview is given to show how the new methods are applicable to evidence theory in law. In addition to being a survey, the article also presents a new view of some key notions vital to the legal logic of evidence.

The two key notions that are most central are those of relevance and probative weight. The notions can be modeled in a new way (or in a way that seems new to many) by introducing a dialogue-based theory of argumentation in which inferences of different kinds are chained together to aim at proving an ultimate conclusion of the dialogue. These notions were already prominent in Wigmore’s theory of evidence,⁵ and the roots of them trace back though Locke and Bentham⁶ to the ancient notion of plausibility in Greek philosophy.⁷ But they seem new because they have been ignored for a long time in mainstream logic, and because only now have they been put together in such a way that they can be modeled in a formal structure. Many of Wigmore’s ideas, like ‘evidence charts’ and ‘probative weight’, that formerly seemed obscure, form a logical point of view, are shown to have a precise logical structure. They show the way to developing new methods for the analysis and evaluation of legal argumentation. Prominent in the new approach is the technique of argument diagramming. Wigmore is shown to have been an important precursor of modern informal logic through his pioneering use of argument diagramming as applied to case studies of legal evidence.

³ Hamblin (1971); Rescher (1977); Barth & Krabbe (1982); Walton & Krabbe (1995).
⁴ Alexy (1989); Feteris (1999); Lodder (1999).
⁵ Wigmore (1940; 1983).
Main Concepts of Argumentation Theory

In this section, a simplified account of the framework of argument evaluation is presented. According to this account, an argument, or other move in argumentation, should be evaluated in light of how that argument was supposedly used for some communicative purpose in a given case. An argument that is supposed to be part of a persuasion dialogue might be evaluated quite differently, in some cases, is used in a negotiation type of dialogue. The reason is that persuasion dialogue and negotiation dialogue have a different purpose. The purpose of persuasion dialogue is for the one party to use rational argumentation to try to prove a particular proposition that is doubted by the other party. The purpose of negotiation is not to prove a particular proposition is true or false, but to 'make a deal' by agreeing to divide up some disputed interests. Using a threat as an argument is often quite legitimate in a negotiation. But using a threat is quite inappropriate in a persuasion dialogue. It has no place as 'evidence' or as a rational argument that is useful to contribute properly to the goal of this type of dialogue.

The six basic types of dialogue are outlined in figure 1.

Figure 1: Types of Dialogue

<table>
<thead>
<tr>
<th>Type of dialogue</th>
<th>Initial situation</th>
<th>Participant's goal</th>
<th>Goal of dialogue</th>
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<tr>
<td>Persuasion</td>
<td>Conflict of opinions</td>
<td>Persuade other party</td>
<td>Resolve or clarify issue</td>
</tr>
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<td>Inquiry</td>
<td>Need to have proof</td>
<td>Find and verify evidence</td>
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</tr>
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<td>Negotiation</td>
<td>Conflict of interests</td>
<td>Get what you most want</td>
<td>Reasonable settlement that both can live with</td>
</tr>
<tr>
<td>Information-seeking</td>
<td>Need information</td>
<td>Acquire or give information</td>
<td>Exchange information</td>
</tr>
<tr>
<td>Deliberation</td>
<td>Dilemma or practical choice</td>
<td>Co-ordinate goals and actions</td>
<td>Decide best available course of action</td>
</tr>
<tr>
<td>Eristic</td>
<td>Personal conflict</td>
<td>Verbally hit out at opponent</td>
<td>Reveal deeper basis of conflict</td>
</tr>
</tbody>
</table>

All these types of dialogue can be used as normative models for evaluating arguments in different kinds of cases of legal argumentation. But probably the most central kind of case you are wondering about is the use of argumentation in a trial, like a criminal trial, for example. In the model of the new dialectic, this type of argumentation is best viewed as a kind of persuasion dialogue, although a very special kind surrounded with many special procedural rules.

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depending on the court, the jurisdiction, etc. But there is also information-seeking dialogue involved, for example in the use of expert testimony.

Relevance of an argument, in the logical sense, according to the new dialectic\textsuperscript{10} is dependent on the type of dialogue the argument is supposedly part of. As noted above, for example, an argument expressing a threat may be relevant in a negotiation dialogue but irrelevant in a persuasion dialogue. Wigmore was aware of this conversational relativity of relevance. He cited a case of an ordinary conversation to show how there can be a shift from one type of dialogue to another.\textsuperscript{11} Two gentlemen in a train are discussing the issue of whether a certain type of rose can be grown from cuttings in their climate. Just then the waiter puts menus before them and asks what they will have for dinner. The conversation shifts from the discussion about the persuasion dialogue about rose growing to a deliberation on what to choose for dinner.

In a persuasion dialogue, there is a central thesis or proposition to be proved by one party. In a legal trial it is called the \textit{factum probandum}. The one side tries to prove this thesis by putting forward arguments while the other side tries to cast doubt on the worth of these arguments. The side who has the burden of proof, called the proponent, uses a series of small steps that are connected to each other. Each single step is an inference, and represents an argument of a distinctive type. Some arguments are deductive, and some are inductive, but many of them tend to fall into a third category. This third category, as shown in Figure 2, is often called 'abductive'.\textsuperscript{12}

This third category is especially important in legal argumentation, of the kind used for example in a trial, because so much of the evidence in a trial tends to be defeasible. Testimonial and circumstantial, by their very nature, belong in the third category. Testimonial evidence depends on the credibility of a witness, and circumstantial evidence is drawn by an inference in which the conclusion is an extrapolation from the premise. Most of the evidence introduced in a trial comes though the examination of witnesses. The arguments used by both sides in a case cite the statements drawn from the witnesses as 'evidence'. This legal usage always seems to me a bit peculiar, because a witness could be mistaken, or could be lying. What one witness says can even contradict, or appear to contradict, what another says. It appears from this usage that legal evidence is taken to be a fallible or defeasible notion. Something a witness said is 'evidence' for now, even though it may later be refuted, or shown to be false testimony. At any rate, the inferential structure of evidence takes various forms as species of arguments. Argument from testimony is classified as a species of argument from position to know.\textsuperscript{13}

According to this form of argument, if someone who is in a position to know

\textsuperscript{10} Walton (1998).

\textsuperscript{11} Wigmore (1935), p. 8.

\textsuperscript{12} Josephson & Josephson (1994).

\textsuperscript{13} In Walton (1996), pp. 61-67.
whether a statement is true or false asserts it is true (or false) then that is a reason for tentatively accepting the conclusion that it is true (or false). But these kinds of inferences are inherently presumptive in nature. Forms of argument representing many different kinds of presumptive arguments have now been studied and classified in recent work in argumentation theory.

Figure 2: Types of Arguments

**Deductively Valid Arguments**

All birds fly  
Tweety is a bird  
Tweety flies

**Inductively Strong Arguments**

Most birds fly  
Tweety is a bird  
Tweety flies

**Abductively Plausible Arguments**

Birds (typically) fly  
Tweety is a bird  
Tweety flies

**Argumentation Schemes**

Logic may be no help when it comes to judging whether an individual statement is plausible or not. A statement has probative weight if it appears to be plausible. But that may just be a matter of how things appear. Where logic is valuable is in judging how probative weight is transferred over inferences. In particular, such inferences typically have the form of one of the kinds of arguments we know as argumentation schemes. Each argumentation scheme has an attached set of appropriate critical questions. The critical questions are those a rational respondent in a dialogue should ask when confronted with this type of argument, as used by the other party in the dialogue.

The argument from position to know is a common form of argument in which one party asks a second party for information that the second party is presumed to possess. For example, suppose a stranger to a city asks a passerby where the Central Station is located. The stranger presumes that the passerby may have this information, if the passerby looks like a person who is familiar with the area. Argument from position to know has the following general form.
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**Argument from Position to know**

**Major Premise:** Source \( a \) is in a position to know about things in a certain subject domain \( S \) containing proposition \( A \).

**Minor Premise:** \( a \) asserts that \( A \) (in Domain \( S \)) is true (false).

**Conclusion:** \( A \) is true (false).

Matching the argument from position to know are the following three critical questions:

- **CQ1:** Is \( a \) in a position to know whether \( A \) is true (false)?
- **CQ2:** Is \( a \) an honest (trustworthy, reliable) source?
- **CQ3:** Did \( a \) assert that \( A \) is true (false)?

The argument from position to know is taken shifts a weight of presumption in a dialogue towards one side. If an appropriate critical question is posed by the respondent, the weight to restore presumption shifts to the other side. Only if the question is answered satisfactorily is the original weight of presumption restored.

Argument from expert opinion, often called the appeal to expert opinion in logic textbooks, is a special subtype of argument from position to know. Argument from expert opinion has the following form (argumentation scheme):\(^{14}\)

**Argument from Expert Opinion**

**Major Premise:** Source \( E \) is an expert in subject domain \( S \) containing proposition \( A \).

**Minor Premise:** \( E \) asserts that proposition \( A \) (in domain \( S \)) is true (false).

**Conclusion:** \( A \) may plausibly be taken to be true (false).

Appeal to expert opinion is subject to defeat, because experts are fallible. Appeal to expert opinion, as a species of argument from position to know, brings forward a weight of presumption subject to retraction depending on the asking of appropriate critical questions by the respondent in a dialogue. The following six basic critical questions for the appeal to expert opinion are:\(^{15}\)

1. **Expertise Question:** How credible is \( E \) as an expert source?
2. **Field Question:** Is \( E \) an expert in the field that \( A \) is in?
3. **Opinion Question:** What did \( E \) assert that implies \( A \)?
4. **Trustworthiness Question:** Is \( E \) personally reliable as a source?
5. **Consistency Question:** Is \( A \) consistent with what other experts assert?
6. **Backup Evidence Question:** Is \( A \) 's assertion based on evidence?

Each of these critical questions is very important to evaluating an appeal to expert opinion used in a given case. In many legal cases, there are expert witnesses on both sides, and so asking the consistency question may trigger

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other questions. Thus uncertainty raised by the asking of a basic critical question can lead to various subquestions extending the dialogue.

It may not be clear how question 1, concerning credibility, is different from question 4, concerning personal reliability. According to previous analyses\textsuperscript{16} the two questions should be seen as different. The trustworthiness question is a matter of the honesty of a source. It is a question of the ethical character of a source. The expertise question is a matter of the competence of the expert. An expert has credibility because she has knowledge and good judgment skills in applying that knowledge to a problem. The expert's competence is perhaps the more obvious factor on which an appeal to expert opinion rests as a good argument. But as Waller has shown,\textsuperscript{17} the testimony of a lying expert can be just as misleading and devoid of value as the testimony of a sincere incompetent.

Position to know argumentation is based on the assumption that if someone is a source regarding some proposition that is in question, then she is in a position to know whether that proposition is true or not. This kind of argumentation is useful because the user does not have direct access to the evidence in a way that the source does. An assumption is that the source is reliable – meaning that it is reasonable to presume that the source will give an accurate, true, or at least reliable account of what happened, as the situation appears to her.\textsuperscript{18} Thus one common aspect of both schemes presented above is that the worth of the argument is based on the credibility of the proponent as a reliable source who has ethical character for honesty. Thus critical questions addressed to the character of the proponent are, in principle, relevant.

The schemes outlined above are only some of the many argumentation schemes that are vitally important in legal argumentation and evidence. The presumptive argumentation schemes presented in Walton (1996) comprise many of the most important kinds of inference that are used in legal argumentation. Perelman & Olbrechts-Tyteca (1969) identified many other distinctive kinds of arguments that can be used to carry probative weight in relation to a disputed issue on a provisional basis. Arthur Hastings\textsuperscript{'} Ph.D. thesis (1963) presented the first systematic modern taxonomy describing many of these argumentation schemes, along with examples of their use in everyday conversational argumentation. Recently Kienpointner (1992) has produced quite a comprehensive listing of many argumentation schemes, stressing particularly the deductive and inductive forms not included in the treatment of Walton (1996). Among the presumptive argumentation schemes presented and analyzed in Walton (1996) are argument from sign, argument from example, argument from commitment, argument from position to know, argument from expert opinion, argument from analogy, argument from precedent, argument

\textsuperscript{17} 1988, p. 126.
\textsuperscript{18} Wagenaar, van Koppen & Crombag (1993).
from gradualism, and the slippery slope argument. In other recent writings on argumentation, like Van Eemeren & Grootendorst (1992), there is a good deal of stress laid on how important argumentation schemes are in any attempt to evaluate common arguments in everyday reasoning as correct or fallacious, acceptable or questionable.

Chaining of Inferences in a Typical Case

To grasp the elements of evidence, and how they work together in a case to make something evidence, we need to illustrate how reasoning is used in a typical case. But if that typical case is too complex, as it would be in any realistic case, how these elements work together will be lost in a sea of details. For in any real case, a body of evidence is a mass of small details making up a large picture. So let us take a very sketchy kind of case that is too hypothetical and incomplete to be real, but that is specific enough to suggest how the logically essential components of evidence in a real case typically function together to support a conclusion. Let us take a case of fact-finding reasoning used in a criminal case. Let us say that Pek is a murder suspect in a stabbing, and the knife, supposedly the murder weapon, is found at the crime scene. Then a forensic investigation reveals that Pek’s fingerprint is found on the knife. In comparable cases using the same kind of reasoning, the evidence could be fingerprints, blood samples, or any other empirical finding of these kinds. But just to choose an example, let us consider a case where the evidence is a fingerprint. Why, in such a case, is the fingerprint correctly taken to be evidence? This simple question will seem trivial to some, but from a logical point of view, it is a lot harder to answer than you might initially think. Of course it is easy to say that it is just common sense that the fingerprint is evidence. But from a point of view of logic and evidence theory, the aim is to try to grasp how reasoning can correctly be used in such common sense judgments, and what sort of reasoning it is. The reasoning needs to have some kind of identifiable logical structure so that any given case can be examined to judge whether it fits this structure or not. The structure is a chain of reasoning. But what are the links in the chain? Does each link have a form of inference? How are the links connected together to move towards the ultimate conclusion in a case? How can we judge the strength or weakness of each individual link? And how can these judgments be summed up within a mass of evidence in a given case? The typical case outlined below is a purely hypothetical case used to illustrate some main features of the argument diagramming technique as applied to reasoning about legal evidence. Please note that it is not an actual case, or meant to represent any real case.

Turning to our hypothetical case, the best beginning point to answering all these questions begins with a consideration of how argument from expert opinion is used within the chain of reasoning. It is known scientifically that each person’s fingerprint has characteristics that make it special to that person.
It is known from a lot of experience with the technique of fingerprinting that the chances of two different persons having the very same (or an indistinguishable) fingerprint are statistically remote. Experts can use technology to judge whether the fingerprint can be identified as Pek's. So from such a determination, that Pek's fingerprint is on the knife, an inference can be drawn that Pek touched the knife. In a given case, this inference could be wrong. Bob's fingerprint could have been 'planted' on the knife. Or the forensic fingerprint analysis could have been tampered with somehow. Such alternative explanations of how Pek's fingerprint got on the knife are logically possible. There could be all sorts of alternative explanations why Pek's fingerprint was on the knife. But unless there is a reason to assume that one of these other explanations is applicable, the conclusion that Pek's fingerprint was on the knife can reasonably be drawn by a plausible inference.

But even though the conclusion can be plausibly be drawn that Pek touched the knife, in the absence of evidence to the contrary in the case, how can the process of reasoning get from there to the conclusion that Pek killed the victim? That process is based on a cluster of plausible inferences that lead to the ultimate conclusion that Bob killed the victim. The first premise is that the knife was found at the crime scene. Another premise is the proposition that the cause of death was by stabbing with a knife, as would be established by the expert analysis of the medical examiner. Putting these two premises together generates the conclusion that the knife was the murder weapon. Now we have two important conclusions that have tentatively been supported by plausible reasoning. One is that Pek touched the knife. The other is that the knife is the murder weapon. Now the problem is to reconstruct the chain of reasoning that would, in the normal kind of case we are considering, lead to the ultimate conclusion that Pek killed the victim.

The key link is the following inference. Since Pek touched the knife (or so we presume from the reasoning above), it can be assumed that Pek used the knife to stab the victim. The connection here is a plausibilistic one, based on an abductive inference about the normal and expected ways of doing things in everyday life. To stab someone with a knife, you normally grasp the knife. A normal way of carrying out that action is to grasp the knife with your hand, without any glove, or other barrier between your hand and the knife. This normal way of doing things is familiar from common experience. And so if a person's fingerprint is on the knife, and the conclusion can be drawn that he touched the knife, leaving the fingerprint as evidence, then that evidence generates more evidence. In this case the inference plausibly drawn form the evidence is that Pek used the knife to stab the victim. So as soon as Pek's fingerprint is found on the knife, the plausible conclusion drawn, in light of the prior chain of reasoning outlined above, that Pek is that pek used the knife to stab the victim. This factual finding is mainly what is needed to prove the ultimate conclusion that Pek killed the victim.
You might think this foregoing analysis of the chain of reasoning in such a typical case is trivial. It seems trivial, because it is based on many common sense assumptions that we normally take for granted in everyday reasoning. But is just this kind of everyday plausibilistic reasoning that is characteristic of the argumentation in legal evidence. So for any theory of evidence, the question of how the inference from the fingerprint to the ultimate conclusion is, or should be drawn in a case like this one, is absolutely vital. From a viewpoint of a theory of evidence, the problem is to find the structure that holds the body of evidence together in a case, by connecting all the logical inferences together in some kind of coherent structure. Four possible answers to the question are the following:

1. the conclusion is drawn by inference to the best explanation;
2. the conclusion is drawn by argument from sign;
3. the conclusion is drawn by an abductive or plausible inference, based on a hypothesis;
4. the conclusion is drawn by a chaining together of a sequence of inferences represented by an argument diagram.

These answers are all correct, and each of them is part of grasping how argumentation works in legal evidence. Each single step of inference tends to be abductive, and is an instance of inference to the best explanation. Many of the steps have the form of argument from sign. But the most important aspect of evidence, and the best place to begin any account of how argumentation works in cases of legal evidence, is with item 4.

**Argument Diagramming**

The technique of argument diagramming models premises and conclusions in an extended sequence of arguments as points (vertices) in a directed graph (digraph). It tends to be assumed that argument digraphs are a recent innovation of informal logic. But, although it is not widely known in informal logic circles, the legal evidence theorist John H. Wigmore worked out the practical foundations of the technique in the 19th century, and applied it to extensive case studies of legal evidence. A Wigmore evidence chart is what now is called an argument diagram. It is a directed graph structure made up of points that represent propositions and arrows that represent steps of inference. The best simple illustration is Wigmore's own diagram representing a typical mass of evidence.19

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Wigmore's Diagram Representing A Typical Mass of Evidence

Wigmore uses P to represent the proposition to be proved (factum probandum). T represents a 'testimonial assertion', and C represents a 'circumstance'. Describing the diagram below, Wigmore wrote, "the following chart will illustrate the analysis of a typical mass of evidence for any proposition whatever."

\[ T \rightarrow C \rightarrow P \]
\[ T \rightarrow C \rightarrow P \]
\[ T \rightarrow C \rightarrow P \]


Wigmore worked out many highly detailed cases using his advanced, but often though to be eccentric, system of notation. But advances in artificial intelligence and argumentation theory are more and more vindicating the worth of Wigmore's technique.

The best way to simply illustrate how argument diagramming applies to cases of legal evidence is to work up an elementary diagram to represent the chain of reasoning in the hypothetical case of Pek and Vik. The argument diagram worked up below will show how the inferences in the case of Pek and Vik need to be fitted in with additional inferences to make up a chain of reasoning. First, some context of the argumentation used in the case needs to be stated, as follows.

Case: Pek is a murder suspect in a case in which Vik died, apparently of multiple stab wounds. A knife, supposedly the murder weapon, was found at the crime scene. The police investigated the crime scene and collected all the evidence they could find.
The diagram needs to begin with the contextual statement of the case, above, and then reconstruct what conclusions can be drawn. In any real case, there would be many details that would be important. If the argumentation were to be considered in a trial, for example, there would be examination of witnesses, and what inferences could be drawn would depend on details of the examination process. Ignoring many of these details that would be vital in any actual case, the object here is to show in a typical kind of case the general pattern of how the most important kinds of inferences can be chained together so that some ultimate conclusion can be inferred. The first inference to consider is the following:

1. a fingerprint was found on the knife;
2. the fingerprint on the knife is Pek’s fingerprint;
3. therefore, Pek’s fingerprint is on the knife.

Both premises of this argument would need to be supported by further arguments in the typical kind of case considered here. But especially the second premise needs support. It is based on an appeal to expert opinion. The form of the argument required to support this premise can be expressed by the following inference:

4. source $E$ is an expert in forensic science containing knowledge of fingerprinting;
5. source $E$ says that the fingerprint on the knife is Pek’s fingerprint;
6. therefore, the fingerprint on the knife is Pek’s fingerprint.

Then there is a third inference that is an important part of the chain of reasoning:

6. the knife was found at the crime scene;
7. the cause of death was stabbing with a knife;
8. therefore, the knife found at the scene was (plausibly) used to kill Vik.

This inference is plausibilistic. Further evidence could show it to be wrong. But it has a weight of presumption if it can be supported. The second premise needs to be supported by an appeal to expert opinion, something like the following one:

9. the medical examiner is an expert on cause of death;
10. the medical examiner says that the case of death was stabbing with a knife;
11. therefore, the cause of death was stabbing with a knife.

Finally there is another key inference that links the fingerprint to the stabbing. This inference can be reconstructed as follows:

11. if Pek’s fingerprint is on the knife, and the knife found at the scene was (plausibly) used to kill Vik, then it is plausible to hypothesize that Pek used the knife to stab Vik;
12. Pek’s fingerprint is on the knife;
13. the knife found at the scene was (plausibly) used to kill Vik;
14. Pek used the knife to stab Vik.

Finally, one last inference is required:
12. If Pek used the knife to stab Vik, and the cause of death was stabbing with a knife, then Pek killed Vic;
8. Pek used the knife to stab Vik;
7. The cause of death was stabbing with a knife;
13. Pek killed Vik.

Proposition 13 would represent an important factual finding in a criminal case of the kind being discussed. It would be an important finding in relation to the ultimate issue in a murder trial. The chain of reasoning in the argumentation leading to proposition 13 can be represented by the argument diagram in Digraph Pek, below.

Why is it that as soon as Pek’s fingerprint is found on the knife, the conclusion that Pek killed Vik can be inferred by the chain of plausible reasoning represented in Digraph Pek? The reason is contextual. Pek is a murder suspect in a stabbing. This fact places the above chain of inferences in a context. That context can be sketched out as follows. Vik was found dead by the police. He had apparently been stabbed to death with the knife found at the scene. Legally, there is an issue raised by such a finding. Whoever did the stabbing, or was responsible for it, could be guilty of the crime of murder. The officials responsible for investigating such crimes need to find the stabber, along with whatever else they can find that is relevant to the issue of murder, or that might throw light on what happened. Hence the proposition that some person, say Pek, is the stabber, is relevant. It is a proposition that is very worthy of being proved or disproved. Therefore, any reasoning based on findings in the case that is useful to prove or disprove this proposition is relevant. So suppose then that Pek’s fingerprint is found on the knife. Suppose also that Pek is a suspect, because, he was somehow closely related to the victim or known to the victim. In such a context, the proposition that Pek’s fingerprint was found on the knife is relevant.

To sum up this section, it was shown by examining a typical case that the relationship between the evidence (the fingerprint) and the factum probandum is more complex than it looks. A series of interlocked inferences are involved. The whole structure of the reasoning used in the case can be represented by an argument diagram. A path running through the diagram shows the connection between the fingerprint finding and the factum probandum. It is this connection that can be used to show why the one proposition is relevant to the other, in the sense of ‘relevant’ appropriate for evidence.
What is Relevance?

What do we mean by ‘relevant’ in relation to evidence? The term ‘relevant’ is very vague, and could mean anything at all. But for purposes of argumentation theory, what it should mean can be very briefly explained as follows. One proposition is dialectically relevant to another proposition if and only if there is a chain of reasoning that leads from the one proposition to the other. What this means is that by a process of reasoning, you can get from the one proposition as starting point to the other proposition as end point. Hence potentially, the one proposition can be used to prove or disprove the other. The Wigmorite way to express relevance in legal argumentation to say the one proposition has potential ‘probative weight’ as part of a chain of argumentation that could lead to the other proposition as conclusion. In the present case then, the problem is – how do we get from what has been found or presumed to be found in the case to the highly relevant conclusion (in the context) that Pek
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killed Vik. This conclusion is relevant in the context of the case generally, because if the proposition 'Pek killed Vik' is true, then there is a potentially plausible line of inference from there in the case to the ultimate conclusion that Bob is guilty of the crime murdering the victim. It may not work out that way in the end. But there is a pretty good expectation, as far as we may be able to tell at the beginning stages of the investigation or trial, that things will or may go that way.

The inferences shown in the argument diagram above function together in a chain of reasoning that leads to the conclusion that Pek killed Vik. The conclusions of each of the subarguments function as premises in other arguments that exclude persons other than Pek who are linked to the knife and the crime scene. The chain of argumentation narrows down the range of possible perpetrators, strongly indicating Pek. The chain of reasoning ties Pek directly to the use of the murder weapon, suggesting he actually carried out the stabbing personally. All propositions in the argument diagram are significant as evidence in the case for two reasons. First, they can be used, as in the chain of reasoning sketched out above, to infer the conclusion that Pek killed Vik. Second, that conclusion is relevant, along with other evidence, as leading towards the ultimate conclusion that Pek is guilty of murder. The argument diagram displays the chain of reasoning used to get from the various findings in the case, that function as premises, to the conclusion that Pek killed Vik. The conclusion is, of course, only a plausible hypothesis that is a best explanation of the findings in the case. So the argument diagram displays the network of inferences that makes up the mass of evidence in the case. The 'evidence' so-called is represented not only by the presumed facts reported by police investigators. It is also represented by the inferences that can be logically inferred from these presumed facts by plausible reasoning. The whole package of evidence for the contention that Pek killed Vik represented by the argument diagram, is based on an argument reconstruction of the case. In this reconstruction, implicit premises are filled in, based on the argumentation schemes that reveal the form of each step of inference. Typically, in a case of evidence in a criminal trial, for example, much of the evidence will be based on arguments that have the form of appeal to expert opinion. Knowing the structure of this argumentation schemes is vital to reconstructing the argument diagram for a given case.

Finally, the primary question can be answered. Why is the fingerprint rightly thought to be dialectically relevant as evidence? The answer comes in two parts. First, we need to ask an additional question for reasons of specification. What is the fingerprint supposedly evidence of? The answer to this question in a legal context is supplied by citing some ultimate conclusion (factum probandum) that is supposedly at issue. Supposedly, the fingerprint is a finding that can be potentially used to bear as an argument on some crime or wrongdoing that is of concern, or legal interest. In the hypothetical case considered above, the crime is murder. So then the fingerprint is potentially
evidence in a murder case. Why then is the fingerprint considered to be relevant evidence? The answer is that the finding of the fingerprint can be used as a premise in both of the basic inferences above, and these two inferences lead by a chain of reasoning to the ultimate conclusion to be proved or disproved in the case.

It has been shown that relevance is determined by several factors in a given case. One factor is the type of dialogue. A second factor is the goal of the dialogue, or what is to be proved, disproved, or otherwise settled by the argumentation in the dialogue. A third factor is the argumentation scheme, and the critical questions matching the scheme. A fourth factor is how the given proposition, or bit of evidence, can be chained forward so that the factum probandum is the end point in an argument diagram representing a chaining forward from that given proposition. What shows the connection is an argument diagram, a directed graph that leads from the one proposition to the other. The problem is that in the middle of an argument— for example, in a trial— it may be difficult or even impossible to judge in advance what direction a line of argumentation may take. For practical purposes, relevance will be judged according to the purpose of the dialogue and the practical constraints on it. Relevance is often a practical matter of avoiding undue delay and costs so that a meeting, trial, or other type of speech event, can fairly give a hearing to the arguments with significant probative value on both sides.

A brief comment must be made here on the distinction between logical relevance and legal relevance. This distinction was fundamental to the great controversies among the leading evidence theorists cited in the footnotes to Tillers' edition of Wigmore's Treatise.20 These controversies show that there are great differences of opinion about the relationship between logical evidence and legal evidence. All that can be said here is that legal relevance is determined by legal rules like the FRE (1997), and by the application of these rules to cases. But underlying legal relevance there should be a coherent notion of logical relevance. Above, it has been argued that logical relevance is best seen as dialectical. In other words, it should be seen not only as a matter of logical reasoning, but as a matter of how that reasoning has been used for some purpose in a dialogue in a given case.

What is Probative Weight?

The view of how relevance works in the simple case briefly sketched out above is inferential and contextual. It is inferential in the sense that it implies that relevant evidence is always evidence for something—some conclusion that can be drawn or inferred. It is contextual in the sense that it implies that something is relevant evidence only to the extent that it can be used to help settle some claim that is in dispute, or subject to doubt. These claims often

seem to defy ordinary usage. We sometimes say that an object, like a freezer chest, for example, is relevant evidence. But on the view of relevance defended here, an object like a freezer chest would only be relevant evidence to the extent that inferences can be drawn from presenting it or seeing it. It is relevant if these inferences can be used to help settle some claim that is subject to doubt or disputation. For example, if the freezer chest was alleged to have held a body cut up by a murderer, then it could function as evidence. But Wigmore would have said that presenting such a freezer chest in court could be classified as ‘autoptic preference’, even though, in ordinary discourse, the freezer chest itself would be called evidence.

On the view presented here, evidence always involves an inference, from a set of statements called premises to a statement called a conclusion of the inference. As noted above, such an inference can meet three types of standards of structural correctness – a deductive standard, an inductive standard, and a presumptive (abductive) standard. But structural correctness is not enough to make an inference qualify as evidence. There is another requirement. The premises must have probative weight, and the probative weight of the premises must be transferred forward to, or ‘thrown onto’ the conclusion. This ‘throwing forward’ is called the probative function. The probative function of an inference is the using of the probative weight of the premises, along with the structural correctness of the inference, to increase the probative weight of the conclusion.

But such a throwing of probative weight forward in a single inference may be of no significance in seeing the inference as evidence. For it to represent evidence, there must be some ultimate proposition that is in doubt, or is unsettled, and the single inference must have some place in a chain of inferences that has this ultimate proposition as its ultimate conclusion. As shown by the simple example above, this factor is the chaining forward of a sequence of inferences in evidence. In any given case, of the kind of interest in legal argumentation, evidence is judged in relation to a whole body of evidence in a case. A single inference by itself generally means very little. What is important is how it fits into the body of evidence in the case. Such a body of evidence is made up of a large network of sequences of inference, each inference chained to others.

A key question is – what is probative weight? Probative weight is something that contributes to making a proposition seem to be true. Probative weight gives a rational agent a reason to think or judge that the proposition is true, even though, once further facts are known, the proposition could turn out to be shown false. Other than making these rather cryptic remarks, the notion of probative weight cannot be fully and exactly defined. Probative weight can be equated with plausibility, or what seems to be true. But what is it to seem to be true or to appear to be plausible? The plausible is connected with the
normal or expectable flow of events so that a report is plausible if it appears that it could well have happened.\textsuperscript{21} For example, suppose Helen visited her grandmother who was being cared for in a senior citizen’s home, and she noticed cuts on her grandmother’s arm. Her grandmother could not remember how she got the cuts. Helen was worried because she began to suspect that her grandmother was being mistreated. She asked the nurse for an explanation. The nurse showed Helen a handrail on the stairway bolted to the wall with metal plates. She showed Helen how her grandmother has stumbled on the stairs, grasped the handrail, and then moved to the wall where she cut her arm on the metal plate. This explanation appeared quite plausible to Helen, after she thought about it. Her grandmother was often forgetful about daily events in the recent past. Even though she said she could not recall falling on the stairs, it was quite possible that she forgot the incident. So what does ‘plausible’ mean in a case like this. It means that Helen found the story of the falling on the stairs incident believable enough that it resolved the doubts or worries she had about mistreatment. The story or account given by the nurse seemed enough like it could be true. Why? Because it seemed ‘in place’ in the setting. It seemed like a fairly normal, expectable or typical kind of event that might easily have happened in the setting. We have an old, frail, forgetful person. We have steep stairs that the old person was always walking down to get to the common room. An dos forth. When you look at the total situation and all the elements in it, it adds up, as we say. The story of the falling against the metal plate is plausible. And if the nurse appears to be truthful, and there is no reason to discount or disbelieve what she says, its plausibility is reason to accept it.

Wigmore on Probative Weight

Wigmore’s theory of evidence is based on the concept of probative weight, and how probative weights of single propositions in a case are distributed in a total body of evidence. According to his theory, the total body of evidence on either side of a legal case can be represented as a network of connected inferences. The whole network is connected to and leads towards a single proposition – the ultimate conclusion at issue. A strong point in Wigmore’s theory is that it treats legal evidence as based on plausible inferences of a kind that can carry probative weight, but are potentially subject to defeat by the introduction of further evidence as a case evolves.

Twining (1985) has shown how Wigmore’s theory of evidence was based on Bentham’s notion of probative weight. Bentham called probative weight ‘probability’, but it strongly appears that when used he used this term, he had something in mind like the ancient notion of ‘probability’ or plausibility. In Bentham’s theory,\textsuperscript{22} there are two parts to establishing the probability of a

\textsuperscript{21} Rescher (1977).
\textsuperscript{22} Bentham (1962).
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proposition, as shown, for example, by cases of witness testimony. One is the probability of the proposition itself, which might be indicated by the confidence of the witness. The other is the adjustment of the original probability value carried out as a result of the process of examining the testimony.\textsuperscript{23} Other factors mentioned by Bentham are the internal consistency of the testimony, and the usual or unusual nature of the event itself. For example, if a witness claimed that damage to a garden was caused by a falling balloon, the unusual nature of this event would tend to detract from its probability.\textsuperscript{24} Judging from this example, probability in Bentham’s sense is contextual, and is highly reminiscent of the ancient notion of plausibility.

One of the central ideas in Bentham’s theory of evidence is the so-called ‘chain of reasoning’, defined as a sequence of inferences,\textsuperscript{25} such that each premise or conclusion has a given probative weight, or degree of probability, and this weight is redistributed as new evidence comes in. Wigmore, like Bentham, built the theory of evidence around the notion of a chain of plausible inference forming the body of evidence in a case. As an example of such a plausible inference Wigmore\textsuperscript{26} of a man who came into possession of a large sum of money after a robbery. Once established, this fact leads by plausible inference to the conclusion (hypothesis) that he got the money from a robbery. But the inference is only one explanation among other hypotheses that could also explain the given fact. There could be several other explanations – the man could have received a legacy, or made some winnings in a gambling game. So the conclusion drawn is best seen as an ‘inference to the best explanation’ – a plausible but defeasible inference.

Does the root of this Benthamite idea of probative weight or plausible inference go even farther back? For starters we could note that it is expressed in Locke’s \textit{Essay Concerning Human Understanding}, in Book 4, Chapter 15. Locke’s example\textsuperscript{27} is the story of the Dutch ambassador who told the king of Siam that the water in Holland would sometimes freeze so hard that people could walk on it. The king, because of his lack of experience of cold conditions, found the story implausible. At any rate, it is clear that Locke was familiar with plausible reasoning as an epistemological concept. But it is not hard to see that the roots of plausible reasoning go back much further. As Jonsen & Toulmin (1988) showed, the medieval tradition of casuistry deriving from Cicero’s method of weighing ‘probable reasons’ on both sides of a legal or ethical case, had plausibility (‘probability’ it was called) as its central tool of reasoning. The casuists would weigh up the probable arguments on both

\textsuperscript{23} Twining (1985), p. 28.
\textsuperscript{24} Twining (1985), p. 54.
\textsuperscript{25} P. 65.
\textsuperscript{26} 1940, p. 420.
\textsuperscript{27} Locke (1726), p. 276.
sides of a case, and then decide which opinion, in the case of a conflict of opinions, was the more probable.

So although the concept of plausible reasoning has not been in the mainstream of logic, it has a history of use, both in ethics and in philosophy of law. Wigmore's theory of evidence was based on the notion of probative weight in Bentham and Locke. But this notion had ancient roots even older than the time of Cicero. It was an idea that was highly familiar to the ancient Greek philosophers.

Revival of the Ancient Notion of Plausibility

One of these is the ancient concept of plausibility or seeming-to-be-true, often translated from the Greek as ‘probability’. But to modern ears, the term ‘probability’ means numerical probability in the statistical sense. In the ancient sense, it refers to something that is generally accepted as true, or seems to be true, based on appearances. In this ancient sense, probability is a fallible guide to acceptance. While it is often a reasonable basis for acceptance, it can be wrong. In some cases it can even be contradictory, because the appearances are conflicting. In some cases, it can also be misleading. Nevertheless, in many cases, plausibility is all we have to go by, and if harder evidence is not available, it is best to reason with plausibility-based evidence, and even to tentatively accept it, and act on it. new dialectic.

The most famous illustration of plausible reasoning in the ancient world was a matched pair of arguments called the eikotic argument and the reverse eikotic argument. A description of this pair of arguments can be found in Plato, but Plato cited two sophists, Corax and Tisias, who lived around the middle of the fifth century BC, as the inventors. The eikotic argument was also described by Aristotle in the Rhetoric (1402a17-1402a28), where it was attributed to Corax.

The Eikotic Argument

In a trial concerning a fight reported to have taken place between two men, one man was visibly bigger and stronger than the other. The weaker man, appealing to the jury, asked whether it appears likely to them he, the smaller and weaker man, would likely have assaulted a much bigger and stronger man. Would this hypothesis be plausible? Putting themselves into the position of the smaller man in the given situation, the people in the jury could each individually appreciate that it would be unlikely they would attack the larger man. The conclusion: it is improbable that the smaller man attacked the larger.

The probative function of the eikotic argument as used in such a case depends on a balance of considerations. Suppose that it is just one man’s word

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against the other’s, and that no so-called ‘hard evidence’ is available. The case hangs on a balance. A small weight of plausible evidence on one the side or the other could tilt the balance one way or the other. The weight of plausibility yielded by the eikotic argument would have probative weight against the proposition that the smaller man attacked the larger.

It is interesting to note that it is possible to have a reverse eikotic argument, of a kind that is opposed to the original eikotic argument.

The Reverse Eikotic Argument

The stronger man asks the jury whether it is plausible that he, an obviously much stronger and larger man, would assault the visibly smaller and weaker man. His reasoning runs as follows: he knows how guilty such an assault would appear if the case came before a court. Given this awareness, is it plausible to think that he would attack the weaker man? The conclusion to be drawn is that such a hypothesis is improbable.

The reverse eikotic argument tilts the probative weight back to the other side. According to Gagarin, the reverse eikotic argument was a typical ‘turning-of-the-tables’ argument favored by the sophists of the second half of the fifth century BC.

This notion of plausible inference is very interesting, and one can easily see why is of importance in the kind of argumentation typically used in legal reasoning. But how could such reasoning, subjective as it appears to be, ever be evaluated systematically? In the modern (as opposed to postmodern) view, plausibility is ‘subjective’, and therefore is of no value as evidence, because all evidence should be based either on deductive reasoning to probabilistic reasoning, in the inductive or statistical sense. But the old idea of plausibility postulates a third kind of reasoning other than deductive and inductive. This third form of plausibilistic reasoning is now often called abductive inference, or inference to the best explanation, and is central to new work on artificial intelligence in computer science. But interestingly, this third form of reasoning was recognized and described by Wigmore very clearly, and used in his theory of evidence. From a logical point of view, Wigmore was a man well ahead of his time, and was a strong exponent of plausible reasoning.

Concluding Remark

Above have been sketched out a number of methods and concepts that are currently being developed in applied logic and argumentation theory, including dialogue theory with its classification of types of dialogue, dialectical relevance, argumentation schemes, argument diagrams and plausible reasoning. Wigmore, in developing his theory of evidence, was already relying

heavily on these concepts and methods. He was much hampered by their lack of development at the time. He did rely on authors like Alfred Sidgwick, an early precursor of informal logic, but Sidgwick’s work was unfashionable, and nothing was done in logic to develop it. The tools and techniques needed to support Wigmore’s theory were just not there. Wigmore’s pioneering attempt to develop the argument diagramming technique, his method of evidence charts, for example, was not a success. He took the central notion of probative weight from Locke and Bentham, but mainstream logic did not have the resources to analyze these ideas at the time, or for some time after Wigmore’s death. Some aspects of Wigmore’s theory have been very influential in law, but other aspects it, for a long time, just looked obscure and quaint to both logicians and legal evidence scholars. Once Wigmore’s theory of evidence is supplemented by these new methods however, it looks much more like a theory that does have an underlying logical structure. It is now possible to see how Wigmore was actually an important precursor of the informal logic movement.

Perhaps part of the problem is that the argument diagramming technique did not have any immediately obvious and attractive applications for lawyers. It did not seem to be obviously useful to help an advocate in court, for example, to help improve her argumentation in a case before a finder of fact. It did not obviously seem to be helpful to a judge in summing up the evidence and the line of argumentation on both sides of case. Where the new argumentation-based approach to evidence does seem to be most useful is for the purely theoretical purpose of grasping the structure of logical reasoning in the argumentation in legal evidence. Of course, the case of Pek and Vik outlined above is purely hypothetical, and is highly simplistic in representing the complex mass of evidence that would be characteristic of any real court case. But the structure of the evidence in the case is certainly realistic enough to show the promise of the new approach. From a viewpoint of evidence theory, the new dialectical approach to argumentation outlined above is a promising advance. It shows how sequential logical reasoning represented by argument diagrams, as well as argumentation schemes and dialectical relevance, are clearly identifiable structural components of the argumentation used in legal evidence. Could these techniques have any practical use apart from their purely theoretical use in legal logic? One application that could be suggested is that of the analysis of trial records to reconstruct a precis of the evidence in a given case that could be helpful to lawyers in new trials. The argument diagram could be used to abstract out the key steps of argumentation in the network of reasoning central to the main line of argument in a case. Argument diagrams possibly also helpful to teaching skills of logical reasoning in evidence courses in law schools, once the applicability of these new techniques to legal cases has been more fully worked out. Wigmore used rather
complicated looking evidence charts to represent the argumentation on both sides of a case, showing how all the small steps of not very persuasive arguments make up a mass of evidence that is persuasive. New techniques of informal logic could simplify these evidence charts, and work them up in a form that could be attractive and useful in summarizing the core structure of the evidence in a case.

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