TELEOLOGICAL JUSTIFICATION OF ARGUMENTATION SCHEMES

Abstract

Argumentation schemes are forms of reasoning that are fallible but correctable within a self-correcting framework. Their use provides a basis for taking rational action or for reasonably accepting a conclusion as a tentative hypothesis, but they are not deductively valid. We argue that teleological reasoning can provide the basis for justifying the use of argument schemes both in monological and dialogical reasoning. We consider how such a teleological justification, besides being inspired by the aim of directing a bounded cognizer to true belief and correct choices, needs to take into account the attitudes of dialogue partners as well as normative models of dialogue and communicative activity types in particular social and cultural settings.

Deductive forms of reasoning, like *modus ponens* and disjunctive syllogism, can be justified on the ground that arguments that are instances of them can never lead from true premises to a false conclusion. In the case of a deductive argument it is impossible for the premises to be true and the conclusion false, so if all the premises are true then necessarily the conclusion is also true. This makes deductive reasoning a very safe procedure, allowing no possibility for defeat of a deductive argument, provided it is absolutely certain that the argument's premises are all true. However, deductive reasoning, even when complemented with probabilistic inference, is insufficient to meet all cognitive needs of agents who think and act on the basis of partial knowledge, and interact with their fellows to supplement their limited sensory input and engage in social activities. Humans also need presumptive reasoning according to defeasible argumentation schemes.

   The problem addressed in this paper concerns the justification of defeasible argumentation schemes. The use of such schemes is both necessary (inevitable) and perplexing: they are extensively used in common sense and legal reasoning (and now also in artificial intelligence), but they are not truth preserving and therefore the justification of deductive reasoning does not apply to them. They are fallible, and therefore risky for the concerned agent. The issue is whether this risk is acceptable given the cognitive and practical advantages that such schemes can provide to the concerned agents and communities.

   In both epistemic and practical cognition, but most markedly in the latter type of cognition, uncertainty and lack of knowledge come into play in determining how an agent should reason intelligently based on the information that it has as well as on the information that it lacks. Under such conditions, how can we justify reasoning using an argumentation scheme like argument from expert opinion that might sometimes lead to a wrong conclusion? We will argue that the use of a defeasible reasoning scheme needs to be justified by the teleological argument that the scheme serves the agent's goals (better than nothing, and better than other alternative schemata the agent has at its disposal). This justification should take into account goals pertaining to epistemic cognition (getting to the truth of a matter) or practical cognition (making the best choice in given circumstances), the needs of the agents (finding the solution in time, without using too much cognitive resources, etc.), the kind of interaction in which they are involved, and social values, as well as communal customs and shared practices.

   In section 1 we introduce the reader to a set of basic schemes drawn from (Pollock, 1995), a wider list of twenty-five frequently studied and applied schemes from the informal logic literature, and a more detailed account of six of these schemes, along with the critical questions

that accompany them. In section 2, we set up the preconditions for the project of justifying schemes by showing how a rational agent using defeasible reasoning needs to be defined in a framework of practical reasoning through which it is attempting to realize its goals by carrying out actions in light of the information it has. In section 3, we introduce teleological reasoning as the structure within which the schemes need to be justified as species of defeasible reasoning. In section 4 we argue that schemes need to be justified on this practical basis by referring to the goals of the types of practical and truth-seeking epistemic activities we are engaged in during argumentation. Through these types of activities we link schemes to defeasible reasoning of the kind that has been widely studied in AI. In section 5, we present some abstract normative dialogue models in which use of schemes in problem-solving and truth-seeking activities takes place. In section 6, we bring out social dimensions of embedding schemes and dialogues in social activities. In section 7, we apply a game-theoretical analysis to model argumentation in this embedding. In section 8 it is shown how the process of justification of the other schemes can be derived by a bootstrapping process. Our conclusions are presented in section 9, where we show that error correction is a required part of the process of intelligent reasoning based on argumentation schemes. We show that although intelligent reasoning using defeasible argumentation schemes is a fallible process, it is this openness to error, typically taken as the reason for objecting to their use as justifiable, that makes bootstrapping to their justification possible.

1.Argumentation schemes

We think that John Pollock's basic inference patterns for rationality can be taken as basic, so that further reasoning schemes and their related burdens of proof can be justified in relation to them. Those patterns consist in the following five schemes, including four schemes for defeasible epistemic reasoning, and one scheme for practical reasoning (Pollock and Cruz, 1999, 201ff; Pollock, 272ff.) which we express in the simplest way, referring to the original text for clarifications and refinements:

1. Perception. Having a percept at time t with content P is a defeasible reason for the cognizer to believe P-at-t.
2. Temporal projection. If $t_0 < t_1$, believing that "P-at-t_0" is a defeasible reason for the agent to believe that "P-at-t_1".
3. Statistical syllogism. Believing that "most F's are G's" and that "c is an F" is a defeasible reason for the agent to believe that c is a G (more precisely, If $r > 0.5$ then "Fc and prob($G|F$) $\geq r$" is a defeasible reason for "Gc", the strength of the reason depending upon the value of r).
4. Induction. If B is projectible with respect to A, then believing that "X is a sample of A's all of which are B's" is a defeasible reason to believe "All A's are B's".
5. Planning: believing that "s is a minimally good plan" (namely, a plan which is better than inaction) is a defeasible reason for adopting s (a reason that is defeated by a better incompatible plan).

Here below we present a larger list including what we take, based on the literature and our knowledge of the subject, to be twenty-five of the schemes that have proved to be most widely useful and familiar in analyzing arguments and fallacies of the kind dealt with in informal logic textbooks, and in special contexts like legal argumentation (for a more complete list of over sixty such schemes the reader is referred to chapter 9 of (Walton Reed and Macagno, 2009).

1. Argument from Position to Know
2. Argument from Witness Testimony
3. Argument from Expert Opinion
4. Argument from Analogy
5. Argument from Verbal Classification
6. Argument from Definition to a Verbal Classification
7. Argument from Rule
8. Argument for an Exceptional Case
9. Argument from Precedent
10. Practical Reasoning
11. Value-based Practical Reasoning
12. Argument from Appearance (Perception)
13. Argument from Lack of Knowledge
14. Argument from Consequences (Positive or Negative)
15. Argument from General Acceptance
16. Argument from Commitment
17. Ethotic Argument
18. Argument from Bias
19. Argument from Correlation to Cause
20. Argument from Cause to Effect
21. Argument from Evidence to a Hypothesis
22. Abductive Reasoning
23. Argument from Sunk Costs
24. Slippery Slope Argument
25. Defeasible Modus Ponens (DMP)

One could question whether this list of schemes represents the ones that should be considered most useful in studying everyday conversational argumentation (including some other special contexts like legal argumentation). But one has to start somewhere, and our preferred point of departure is to begin with the types of arguments we at least have some reasons to think are important to focus on for informal logic. Once some schemes of this sort have been precisely enough modeled so that that they can applied to texts of natural discourse where argumentation takes place, so that instances of them can be identified and counted, work of argument mining can go forward.

There are some good reasons to think that these schemes are commonly used and that they include many of the most important to know about from the viewpoint of informal logic. First of all, these defeasible schemes can be found in informal logic textbooks widely used in the second half of the 20th century, which have identified them in various media sources, often concentrating on instances where they were used wrongly, for example as informal fallacies (Hamblin, 1970). From the literature on informal logic, it has became apparent that these forms of argument, like argument from expert opinion, are not only common, but are also important for informal logic to study, as they subsume a corpus of often-repeated examples mentioned over and over in the logic textbooks.

No research has been published yet within informal logic that studies argumentation schemes by systematically collecting numbers of instances of their use in texts, but there has been relevant

research in artificial intelligence that confirms the relevance of the above list. Gordon and Walton (2009) showed how arguments used in legal reasoning (arguments from precedent cases, rules, policy goals, moral principles and social values and evidence) can be modeled using the same or closely comparable argumentation schemes. Prakken (2010) studied the use of hypothetical and value-based reasoning in U.S. Supreme Court cases, showing how these arguments can be modeled using argumentation schemes of kinds also found in everyday argumentation, and often used in everyday conversational discussions and deliberations. Work has been done on argument mining of legal databases to experimentally see if schemes could be used to identify and collect instances of a certain type of argument, like argument from expert opinion, or argument from precedent (Mochales and Moens, 2011). A technology for argument mining of legal texts (Mochales and Moens, 2009), using a corpus of legal arguments from texts of the European Court of Human Rights, opened opportunities for applying artificial intelligence to text mining in a way that could be used to identify and collect arguments of known types, like argument from expert opinion. Using the list of schemes from (Walton, 1996), argument mining turned up 80 instances of argument from position to know, 10,744 instances of argument from evidence to a hypothesis, 2,385 instances of argument from expert opinion, and 12,229 instances of argument from precedent. This work suggested the possibility that these schemes could also be used to search through databases containing everyday conversational argumentation of the kind found in the news media (Walton, 2011). A pilot project to collect types of arguments used in a Canadian election campaign in Ontario is now using schemes to identify recognizable types of arguments in a text, and is already finding that certain schemes, like the one for argument from negative consequences, are extremely common.

There is no space to describe all the above 25 schemes or to deal with individual problems of justification relating to all of them in this paper. For readers who are not familiar with schemes, below we present a few of them. When an argument is put forward, on a balance of considerations, there are some reasons to accept its conclusion but also some reasons to doubt or question it. Matching each scheme is a set of appropriate critical questions one can ask. The critical questions matching each scheme are presented below it. The argument fitting a scheme is used to shift a burden of proof to one side or the other in a dialogue exchange of arguments and questions.

In all five instances below, the account of the scheme is that given in (Walton, Reed and Macagno, 2008, chapter 9). We begin with the scheme for *argument from appearances*, which corresponds to the argument from perception already cited in the Pollock list above.

Premise 1: Person P has a φ image (an image of a perceptible property).
Premise 2: To have a φ image (an image of a perceptible property) is a *prima facie* reason to believe that the circumstances exemplify φ.
Conclusion: φ is the case.

There is only one critical question attached to this scheme.

CQ_1: Are the circumstances such that having a φ image is not a reliable indicator of φ?

Pollock (1995, 41) offered the following argument as an example.

Premise 1: This object looks red to me.

Premise 2: When an object looks red, then (normally, but subject to exceptions) it is red.
Conclusion: This object is red.

This argument is defeasible, since even objects that are not red look red when illuminated by a red light. Nevertheless, it is an argument that can be justifiably held to hold tentatively, and give a reason to accept its conclusion, if there is no evidence that the situation is exceptional.

The second scheme is the *argument from lack of evidence*. It is sometimes also known as the argument from ignorance.

Major premise: If A were true, then A would be known to be true.
Minor Premise: It is not the case that A is known to be true.
Conclusion: A is not true.

These are the three critical questions matching this scheme.

CQ_1: How far along the search for evidence has progressed?
CQ_2: Which side has this burden in the dialogue as a whole? In other words, what is the ultimate *probandum* and who is supposed to prove it?
CQ_3: How strong does the proof need to be in order for this party to be successful in fulfilling the burden?

The following argument is an example.

Major Premise: There are no known instances of Romans being awarded medals for bravery in battle posthumously.
Minor Premise: If there were instances of Romans being awarded medals for bravery in battle posthumously, we would know of them.
Conclusion: Therefore the Romans did not award medals for bravery in battle posthumously.

To support the conditional premise, the following statements might be offered as evidence: we would see evidence on tombstones or in written records of battles. Under these conditions the argument could be acceptable, even though it is only based on negative evidence.

The third scheme is that for *argument from position to know*.

Major Premise: Source a is in position to know about things in a certain subject domain containing proposition A.
Minor Premise: a asserts that A is true (false).
Conclusion: A is true (false).

These are the three critical questions matching this scheme.

CQ_1: Is a in position to know whether A is true (false)?
CQ_2: Is a an honest (trustworthy, reliable) source?
CQ_3: Did a assert that A is true (false)?

An example would be a tourist asking a shop owner where the Uffizi Gallery is located in Florence. The assumption that the tourist makes is that the shop owner, being a resident of the city, is in a position to know about the location of the Uffizi.

The fourth scheme is *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 is true (false)
Conclusion: A is true (false)

Below are the six critical questions matching this scheme.

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

An example of the use of this sort of argument is a case of expert witness testimony, for example a DNA expert or a ballistics expert, in a court of law.

The fifth scheme is that for argument from witness testimony.

Position to Know Premise: Witness W is in position to know whether A is true or not.
Truth-telling Premise: Witness W is telling the truth (as W knows it)
Statement Premise: Witness W states that A is true (false)
Conclusion: A may be plausibly taken to be true (false)

Below are the six critical questions matching argument from witness testimony.

CQ_1: Is what the witness said internally consistent?
CQ_2: Is what the witness said consistent with the known facts of the case (based on evidence apart from what the witness testified to)?
CQ_3: Is what the witness said consistent with what other witnesses have (independently) testified to?
CQ_4: Is there some kind of bias that can be attributed to the account given by the witness?
CQ_5: How plausible is the statement A asserted by the witness?

An example of the use of this scheme would be the use of expert witness testimony in a trial (Gordon, Walton and Prakken, 2007).

Schemes can be classified into groups, and obviously these three schemes fall into a characteristic group. And as such this group presents special problems of justification. Three of the schemes we have selected to show the reader for purposes of illustration above are based on taking the sayso of another party as evidence. These schemes share the specific problems that this other party might be mistaken, lie, have forgotten something, be biased, and so forth. Of course, the critical questions can make up for the potential failings or errors arising from them. But more generally, there are worries that even having critical questions is a sign that this way of

reasoning requires a special kind of justification. In this paper, we address these concerns in a way that can be applied to all the schemes of the group of twenty-five selected above.

While all of the above defeasible schemes are general types, covering an open set of reasoning instances, one them, defeasible modus ponens, can be viewed as the most general pattern for defeasible reasoning, subsuming many, or even nearly all other schemes. Here is its form:

Major Premise: $\alpha => \beta$
Minor Premise: α
Conclusion: β

The connective => in the major premise denotes defeasible implication. Thus that premises first states the defeasible conditional, 'If α then presumptively β'. This means that the conclusion β follows from α only if there are no exceptions or prevailing reasons to the contrary (rebuttals).

We can see for example how the scheme for argument from expert opinion can now be expressed in the structure of the defeasible modus ponens form.

Major Premise: (E is an expert & E says that A) => A
Minor premise: E is an expert & E says that A
Conclusion: A *is true*

As this example shows, the minor premise need not be an atomic proposition, but may also express a molecular proposition, and in particular a conjunction, the pattern of defeasible modus ponens enables us to cover also schemes whose application requires a set of conditions $A_1, …, A_n$.

As pointed out by Verheij (2008) and Bench-Capon and Prakken (2010), many argumentation schemes can be recast in a defeasible modus ponens form in which the antecedent of the conditional major premise is a conjunction of statements each of which represents a requirement of the original argumentation scheme. Once the scheme has been recast in this form, critical questions can be reformulated as counterarguments that undercut (make inapplicable) the concerned schema or contradict (rebut) its premises. For instance, the critical question concerning the unreliability of the expert could be rephrased as the following undercutter:

E is unreliable => ¬ [(E is an expert & E says that A) => A is true]

According to this undercutter, the major premise above does not hold with regard to unreliable experts, so that the argument from expert opinion is not applicable to them.

We shall not address to a larger extent the issue of the connection between argument schemes and defeasible reasoning. For our purposes it suffices to say that this transformation does not solve the justification problem. The problem of whether the original argument scheme (accompanied by its critical questions) is justified is transformed into the problem of whether the corresponding defeasible conditional, which provides a major premise for the defeasible modus ponens, is justified (when accompanied by its undercutters and rebutters). In our example, rather than asking whether the scheme of argument from expert opinion is justified, we would ask whether the conditional "E is an expert & E says that A) => A is true*" is justified.

2. Preconditions for the justification of argument schemes

In considering how inference schemes can be justified, we need to consider also the capacity of the concerned agents. We aim to provide a way of justification that the reasoning agents themselves can apply to their schemes, to establish whether the schemes they are using are justified or not. According to the definition proposed below (revised from the early account in Walton, 1990), teleological reasoning exhibits eleven properties. In this kind of reasoning, an agent has incoming information about its circumstances, and tries to steer through this set of circumstances towards a goal by means of taking action. At the same time, it has feedback capability and can correct its errors if the path of action deviates from the goal (which may be trying to find the truth). As each of these properties is successively realized in a given case, an action begins to seem more classifiable as teleological, and less as a merely automated, reflexive, instinctive or habitual action.

1. Goals. The first characteristic is that the action is contemplated or carried out based on the agent's goals. Goals are not necessarily the same as intentions or motives.
2. Actions. The second characteristic is the set of actions that affect the situation external to the agent. An agent is an entity that not only has goals, but that can carry out actions based on these goals.
3. Knowledge. The third characteristic is that the agent has incoming information about the situation in which it acts, and can take this information into account as a basis for its action. One particular kind of information the agent processes is some knowledge of the consequences of its actions as it carries out these actions. The agent also needs to be able to estimate some possible or probable consequences of the actions it plans to carry out. Another kind of information the agent needs is common knowledge about the normal or expected consequences of kinds of actions it is familiar with carrying out.
4. Feedback. As the agent carries out a particular action, it can see that this action is either contributing to its goal or is not. For example if it is aiming at a particular goal but sees that an action just carried out is counterproductive, and that it moves away from the goal or prevents the goal from being realized, the agent can correct its actions to move to away from the counterproductive one. This kind of feedback is a species of error correction.
5. Complexity of the Act-Sequence. Instead of only thinking about carrying out each single action as an isolated event, an agent needs to be able to put together sequences of actions and events into connected patterns called scripts or episode sequences. This is where the notion of a plan comes in.
6. Hierarchy of Act-Descriptions. The sixth characteristic is the ability to organize the sequence of actions into an organized hierarchy of general goals and specific actions, sequences of which may need to be organized to contribute to a general goal.
7. Conditional Projections. An agent must have the capability for projecting possible future consequences of contemplated lines of action in relation to the given information about a present situation. This capability is called foresight. It is not an ability to predict the future, but an ability to anticipate possible consequences of hypothetical actions that might be carried out. Teleological reasoning is based on the capability to contemplate different possible lines of action in an uncertain future under conditions of lack of perfect knowledge in order to steer actions through this constantly changing situation in a flexible manner.
8. Plasticity. This means that if one line of action isn't working, the agent will tend to try another. As some alternative lines of actions are blocked off, others will continually be

explored. This characteristic is an indicator of flexible decision-making that involves the retraction of an agent's previous commitments based on new incoming knowledge reflected by circumstances that are constantly changing. The capability of plasticity can be associated with open-mindedness of thinking and adapt ability.

9. Knowledge (Memory). An intelligent agent capable of teleological reasoning needs to keep track of its goals and the actions it has already carried out so it can reapply these to the constantly changing situation. To do this, the teleological reasoner needs to keep a store of commitments in a knowledge base that it can retrieve to retract or reapply in relation to actions already carried out and actions contemplated. A sophisticated type of teleological reasoner needs to have the ability to keep track of it goals, and to change or give them up them when required to do so.

10. Persistence. This characteristic is a special type of plasticity which requires that teleological reasoning will tend to stick with an important goal, once it has set the goal even if sticking with it implies negative consequences and the sacrifice of other goals that have less priority. An agent using teleological reasoning will not give up too easily, even though, as shown by the next characteristic, in some instances it will give up and retract a goal or stop trying to achieve it.

11. Criticism. Higher-order teleological reasoning requires an agent to exercise the ability to criticize its own plans and actions. Such criticism involves, in the simplest kinds of cases the asking basic critical questions, such as the question of whether there are negative consequences of a planned course of action. Another kind of criticism requires the ability to search for practical inconsistencies in a plan, for example finding that in the given circumstances the carrying out of one goal will prevent the carrying out of another one.

In order to be able to engage in the evaluation of inference schemata, an agent need to possess one further capacity, namely, *reflexivity*. This means that it must be aware of its own reasoning processes, and able to take a critical perspective on them. A rational reflexive agent is not only is able to use reasoning in order to pursue its own goals in an effective way, but is able to look critically at its own goals, to assess their merit, their priorities, their coherence with relevant values and the way their achievement contributes to change the world according to its preferences. More generally, such an agent must be able to inspect its reasoning processes and understand how they contribute to or detract from his reasoning performance. It must be able to "direct future reasoning by relying upon generalizations it has formed about the efficacy of certain kinds of reasoning in the past" (Pollock 1995, 41; see also Sartor 2005, Section 4.4.4). In particular, such an agent appreciates that rationality itself is a way to achieve goals and values and is cognizant of the conditions under which its reasoning is likely to enable him to get to true beliefs and to act effectively. Therefore, such an agent adopts rationality itself as one of the values it is pursuing (see Nozick 1993) and models its own reasoning as a way to achieve this overarching goal.

3. Schemes for teleological reasoning

The use of argumentation schemes can be given a pragmatic justification, namely, a justification that is based on teleological reasoning, as instantiated by the scheme for practical reasoning, supplemented by the arguments from positive and negative consequences (see Atkinson et. al 2004). In the following version of the argumentation scheme for practical reasoning, the first-person pronoun 'I' represents a rational agent of the kind described by Woodridge (2000), an

entity that has goals, some (though typically incomplete) knowledge of its circumstances, and the capability of acting to alter those circumstances. The scheme for simplest form of practical reasoning is shown below (Walton, Reed and Macagno, 2008, 323).

Major Premise: I (an agent) have a goal *G*.
Minor Premise: Carrying out this action *A* is a means for me to realize *G*.
Conclusion: I ought (practically speaking) to carry out this action *A*.

As it carries out practical reasoning, an agent also has the capability to perceive (some of) the consequences of its actions as it reasons its way through a situation. As the agent proceeds, typically the situation itself changes in ways that the agent may have incomplete knowledge about. One of the most important qualities necessary for intelligent practical reasoning is flexibility. The quality of the practical reasoning may be poor if the agent sticks rigidly to a fixed plan, instead of taking new information into account and adapting to it. Such reasoning is always a matter of balancing the known against the unknown. An agent needs to reason on the basis of what is not known, in the given situation, in addition to what is known, and even on the basis of what is known about what is not known.

In addition to the uncertainty of the situation, an intelligent agent typically has multiple goals, and also multiple means for carrying out these goals. When all these factors are put together, it means that the agent has to be flexible, and open to critical questions. There are five critical questions matching the scheme for practical inference (Walton, Reed and Macagno, 2008, 323, see also the extended set of critical questions in (Atkinson et al., 2004)).

CQ_1: What other goals do I have that should be considered that might conflict with *G*?
CQ_2: What alternative actions to my bringing about *A* that would also bring about *G* should be considered?
CQ_3: Among bringing about *A* and these alternative actions, which is arguably the most efficient?
CQ_4: What grounds are there for arguing that it is practically possible for me to bring about *A*?
CQ_5: What consequences of my bringing about *A* should also be taken into account?

The last critical question, CQ_5, concerns potential negative consequences of a proposed course of actions. Asking about consequences of a course of the action being contemplated can cast an argument based on practical reasoning into doubt. Such negative consequences, however, may be balanced by further positive consequences that the considered action will have. Therefore, this argument is connected with two further teleologically oriented argument schemes, namely the argument from negative consequences and the argument from positive consequences, according to which an action should not (or should) be done if it has negative (positive) consequences.

In particular, an *argument from negative consequences* may attack an application the practical reasoning by citing the negative consequences of a proposed course of action as a reason against taking that course of action. Here is the scheme for this kind of argument (Walton, Reed and Macagno, 2008, 332):

Premise: If *A* is brought about, then bad consequences will occur.
Conclusion: Therefore *A* should not be brought about.

An argument from negative consequence can be counterattacked through an argument from positive consequences, having the following scheme:

Premise: If *A* is brought about, good consequences will plausibly occur.
Conclusion: *A* should be brought about.

For instance, a proposal for a law that increases student fees in order to cut state funding to universities can be attacked on the basis of the fact that it will put excessive burdens on students and their families, and will reduce access to education. This argument can be countered by claiming that this is the only way to provide money to universities in the current financial situation.

Let us now see how the scheme for teleological reasoning can be applied to the justification of other inference schemes. The action to be taken is the use of an argumentation scheme, accompanied by its critical questions (or more generally the adoption of the scheme as a form of one's reasoning). For instance, let us assume that the agent is wondering whether it should rely at all on experts. Assume that the agent has the goal of having true beliefs (or at least beliefs that are as true as possible, in particular matters that are relevant to its choices). The general scheme of practical reasoning would then be instantiated as follows:

Major Premise: I have a goal of *getting beliefs that are as true as possible, in matters pertaining to my choices*.
Minor Premise: Carrying out the action consisting in executing the scheme "argument from expert opinion", whenever this scheme is relevant, is a means to realize the goal of getting beliefs that are as true as possible, in matters pertaining to my choices.
Conclusion: I ought (practically speaking) to carry out the action consisting in executing, the scheme "argument from expert opinion", whenever this scheme is relevant,

Assume that for a certain agent both premises hold. This agent would indeed be justified in adopting the scheme of argument from expert opinion. This kind of justification may be accessible to the agent itself, if the agent is a reflexive cognitive entity that is able to inspect its own reasoning processes and make choices about them.

Let us now consider a much more questionable scheme, namely, *wishful thinking*, which many of us often make use of:

Premise: I would like that *A* were true
Conclusion: *A* is true

We can find teleological arguments supporting one's decision to adopt wishful thinking, for instance that it bolsters one's confidence, which is a good thing. However, stronger reasons can be brought against the endorsement of this reasoning scheme (by arguments from negative consequences): it is epistemically bad, since it leads one to hold many false beliefs, and it is practically bad, since actions based on wrong assumptions are likely to fail their objectives.

As we shall see later, the combination of schemes just presented is not the only way to perform teleological reasoning. Pollock's planning argument (Pollock 1995, 272ff.) introduced in section 1 above provides a scheme that merges aspects of the three we have just considered.

Here is a simplified representation of it using the same pattern as for the other argument, rephrasing the defeated for this argument into a critical question.

Major Premise: I have a goal *G*.
Minor Premise: Action (plan) *A* is a minimally good way to realize *G* (which means that *A appears to realize G and to be preferable to inactivity with regard to its consequences, including positive and negative ones*).
Conclusion: Therefore, I ought (practically speaking) to carry out this action (plan) *A*.

CQ$_1$: Is there any incompatible action plan *B* that appears to be preferable to *A* (with regard to its consequences)?

Thus according to Pollock, before choosing *A*, we need to compare *A* with regard to the null plan (inactivity). And this argument can be defeated by considering incompatible plans of action, taking into account their anticipated consequences. Thus Pollock's scheme includes the combination of the practical argument with arguments from positive and negative consequences (the latter combined in assessing whether the considered action plan is minimally good).

4. Practical justification of schemes

It is our contention that argumentation schemes need to be justified on a practical basis by referring to the goals of the types of practical and truth-seeking epistemic activities we are engaged in. Each of these types of activities has to be examined, with respect to its goals and to the kinds of arguments that should be considered relevant as means of fulfilling these goals. This means that the justification of argumentation schemes needs to be carried out in a practical manner by determining which kinds of arguments should be used to fulfill the goals and values of the parties using those arguments in a collective goal-directed setting. As each type of activity is identified, we can study the main kinds of arguments used in it by applying a suitable normative model to the activity type. Each argumentation setting needs to have protocols for determining when an argument is suitable to be used, and the normative models of dialogue that can supply these protocols.

One of these types of activities is everyday *deliberation*, where the goal is to decide what the best course of action is in a particular situation under conditions of incomplete information when the situation is constantly changing and new information is coming in. The problem here is that if we wait for more collection and evaluation of information so that the uncertainty can be reduced or even virtually eliminated, it may be too late to make an optimal decision on the best course of action. The best way to solve the problem is to collect the information we have now as a basis for decision, and put forward proposals for action on what seems like the best thing to do, given the values and needs of the group that has to arrive at a decision (Gordon, 1995). The way forward is to put forward as many strong arguments as possible for and against each proposal, then by means of assessing these arguments arrive at a decision on which proposal is best. The problem is that proposals may be closely matched with regard to supporting and attacking arguments, and therefore it might be hard to decide which proposal should be accepted as the outcome of the decision-making process. Therefore it might seem illogical or premature to jump to the conclusion to select the best proposal even though it is only marginally better than the next best proposal. Also, in the face of uncertainty, there is always the decision of whether it might be better to wait until more information is collected before arriving on a final decision on what to

do. The value of argumentation schemes in this kind of situation is that even though they are defeasible, they provide the basis for selecting one proposal as arguably better than another. And schemes can be justified as useful in deliberation, and indeed as necessary to be used in rational deliberation, because there is no alternative.

The basic scheme that is fundamental to deliberation is that for goal-directed practical reasoning. Thus the justification of the other schemes has to be situated in relation to carrying out efficient and prudent practical reasoning, including the value-based variant. To accomplish this, the normative model of deliberation dialogue needs to be applied to the activity type of deliberation.

The second type of activity is the construction and testing of a hypothesis in experimental science in order to construct a theory about which proposition can be taken to be true or false based on the evidence known at a given point in an investigation. Particularly significant in this regard is the kind of reasoning used in the experimental sciences for *knowledge discovery and verification*. In studying argumentation schemes for this kind of activity we need to recognize that there are various stages to the procedure. First, there is a discovery stage in which brainstorming leads to the formulation of a hypothesis that may be premature, given that the experimental evidence for and against it has not been extensively collected yet. Then there is the verification process where the hypothesis is tested against new evidence that is being collected. At this stage, experiments need to be devised to test the theory and see whether it passes or fails the experimental tests. The decision then has to be made whether the theory should be given up, or abandoned for some potentially better theory, or whether it can be saved by revising it, perhaps by adding suitable qualifications that enable the new data to be explained satisfactorily. During this stage, the argumentation scheme for inference to the best explanation is central. The reasoning in this type of activity can be analyzed and evaluated by fitting its particular instances to the normative model of discovery dialogue.

At a later stage of scientific investigation, once a theory has been well tested, and the objections to it have been extensively formulated, the stage is arrived at where a theory or result can be generally accepted or not. The problem here is that of scientific retraction. Advocating a theory too early by claiming in a publication that it should be accepted in a scientific field is regarded as a serious error of the kind that can be highly embarrassing. This kind of error goes against scientific values for rational argumentation, and the device that is used to guard against it is that of burden of proof. In a scientific investigation at the inquiry stage, a proposition should only be accepted as evidence of it can be verified to a high standard of proof. This standard is never one of beyond all doubt, because of the verification principle of scientific inquiry, the principle that a hypothesis should always be defeasible and open to retraction if new evidence comes to be discovered that is sufficient to cast doubt on the scientific acceptability of the old theory. This activity can be modeled as an inquiry dialogue.

The third type of activity considered is *legal argumentation in a trial setting*. One side has made the claim that a particular proposition is true, while the other side doubts that claim, or possibly even advocates a competing claim. Just as in a scientific investigation, the most important device needed to evaluate argumentation is that of burden of proof. Standards of proof are set by law, and as the trial proceeds, the argumentation on both sides is weighed against the standards. The problem is that it is unrealistic to think in the broad majority of cases that enough evidence can be collected, and the case argued so thoroughly by both sides, that the outcome is a conclusive argument that can be accepted beyond all doubt. In a civil trial, the standard is that of preponderance of the evidence. However in a criminal trial, a stricter standard is adopted, since it

is known that errors will inevitably occur, the aim is to minimize the unjust conviction of innocent parties, at the risk of setting some guilty parties free. Under these conditions, arguments can be allowed as admissible and justified to be used, provided they serve the ultimate ends of the activity. This type of activity can fit the persuasion dialogue model, provided that requirements for burdens and standards of proof can be employed to determine when an argument is successful.

Allocation of burden of proof tells each side in a dispute how strong its argumentation needs to be in order to be acceptable. (Farley and Freeman, 1995; Freeman and Farley, 1996) defined burden of proof as the level of support that must be achieved by one side to win an argument. On their analysis, burden of proof acts as a move filter at local moves in a dialogue exchange and as a termination criterion that determines the outcome of proof or not at the end of the dialogue (Farley and Freeman 1995, 156). Burden of proof rests on standards of proof. In law there are four main proof standards called scintilla of evidence, preponderance of evidence, clear and convincing evidence, and beyond reasonable doubt (Gordon and Walton, 2009, 241). The scintilla of evidence proof standard is met if even a small amount of evidence supports an argument. The preponderance of evidence standard is met for an argument if it is stronger than all opposed arguments. The clear and convincing evidence is higher than that of preponderance of the evidence, but not as high as the highest standard in law, that of proof beyond a reasonable doubt. Three types of legal burden of proof are distinguished by Prakken and Sartor (2009, 228). The burden of persuasion specifies which party has to prove some proposition set at the opening stage as the ultimate *probandum* in a case, and specifies to what proof standard has to be met. Whether this burden has been met is determined at the end of the trial. The burden of production specifies which party has to offer evidence on a specific point during the argumentation stage of the trial. The tactical burden of proof indicates what party would risk losing on the basis of the argument so far provided at some point during the trial, and can be shifted by putting forward additional arguments. The arguer must judge the risk of losing if he fails to meet his tactical burden of proof. It is this burden that is so often said to shift from side to side.

One of the arguments most suitable for this kind of activity is the use of witness testimony to support or attack a claim, including the use of expert opinion testimony. In the history of philosophy, many doubts about the accuracy and reliability of witness testimony have been advanced by skeptical philosophers. Clearly, witness testimony is highly selective and fallible, as shown by recent work in the social sciences demonstrating, for example, that perpetrators are often wrongly selected from police line-ups. Given its inherent fallibility, the problem is how to justify the use of the argumentation scheme for witness testimony in the setting of a criminal trial. The justification of its use in such a setting needs to be formulated in relation to the goals and values of the setting, and the protocols that determine how the argumentation is managed, how it is critically questioned, and how it is judged to be weaker or stronger in given instances. This kind of argument is justified based on the assumption that the witness is in a position to know about the events testified to. It is also justified on the basis that it is a defeasible form of argumentation, and should be subject to critical questioning before acceptance. The third condition of the justification of this form of argument in this setting is the openness of witness testimony to effective and probing cross-examination by the opposing side. The fourth condition concerns the requirement set for burden of proof in a criminal trial, namely that of beyond reasonable doubt.

In legal argumentation, there are also protocols regarding the admissibility or inadmissibility of evidence. For example, character evidence is admissible, but is not considered relevant if it

might be used in such a way as to prejudice the jury. From the study of informal logic, we know that character attack arguments, especially the type of ad hominem arguments we are familiar with as used in negative attacks in political campaigning, can be extremely powerful when used in the right circumstances to discredit an opponent's claim. The rules of evidence restrict this form of argument as inadmissible, subject to exceptions. For example, an attack on the credibility of a witness can be considered relevant if it critically questions the trustworthiness of the witness as an accurate source of reliable information.

Hence generally we can say that the criterion of relevance, in all three kinds of argumentation activities we are considering, is an important factor in the justification of the use of argumentation schemes. The use of a particular argumentation scheme is only justified if this kind of argumentation is relevant in that it supports the goals and values of the type of activity concerned.

What about everyday conversational argumentation in which there may be no clearly defined protocols, goals, or burdens of proof that are specified at the beginning point of the argumentation and carried through to serve its ultimate goals? How can we say that a given argumentation scheme is justified or not at some point during the sequence of this kind of argumentation activity? It tends to be harder to judge such questions based on firm evidence, and we need to treat each case differently based on assumptions that we are justified in making about the type of activity that is supposedly underway. For example, one of the most common kinds of conversational exchanges is the critical discussion where one party makes the claim and the other expresses doubts about that claim. Here too, as in the three kinds of settings discussed above, it is rare that the dispute is so one-sided that the claim put forward can be proved conclusively, or beyond all doubt, or alternatively, can be conclusively refuted, and demonstrated beyond doubt to be false. Here too, we have to use argument protocols, standards of proof, judgments of relevance, and all the other built-in features that we used in the other settings to justify the use of a particular argumentation scheme in that setting. Critical questioning serves as a corrective to dogmatic thinking of a kind that treats arguments, like those based on expert opinion, as authoritatively conclusive.

An interesting example of argumentation in everyday life we can consider is the case of going to the doctor. If you were to treat arguments from expert opinion as deductively valid, you would have to accept the universal premise that what an expert says is always a true statement. This makes for a very safe argument that is free from error if the doctor is an infallible authority. But this way of dealing with doctor-patient interviews where the physician recommends a particular treatment is not a way for you as a patient to get the best treatment. It is much better to ask critical questions about alternative courses of treatment, possible or probable side effects of the medication that is being recommended, and whether it would be a good idea to get a second opinion if you have some doubts about the recommended treatment. Even though it is difficult for a patient who is not an expert in medicine to critically question the advice of a physician, asking questions will result in better decision-making than simply accepting what the physician says without questioning it all.

5. Normative models of dialogue

As shown in the last section, argument schemes are not only used in the private reasoning of a concerned agent, but also in acting in a dialogical and social context. In these contexts, the effect of the use of an argument scheme depends not only on its intrinsic merit, but also in the way in

which it is taken by the other parties concerned, with regard to the particular context where the reasoning scheme is going to be used. At a more abstract level, we now introduce the idea that each of these settings can be represented by a normative model of dialogue that has goals, rules (protocols), moves, speech acts and commitment sets, of the kinds illustrated in Walton and Krabbe (1995). Such rules govern the moves made by all the parties, when they take turns contributing speech acts to the sequence of argumentation. For example, one speech act is the putting forward of a proposal when a group of people, or even a single individual, is deliberating on what to do. A dialogue is defined as an ordered 3-tuple $\{O, A, C\}$ where O is the opening stage, A is the argumentation stage, and C is the closing stage (Gordon and Walton, 2009). At the opening stage, the participants agree to take part in some type of dialogue that has a collective goal.

The simplest types of dialogue are normative models of an abstract kind, and they do have bite, because once the participants agree to take part in a certain type of dialogue, the subsequent events are constrained not only by the goal for that type of dialogue, but by the types of moves that are allowed because they contribute to the goal of the dialogue. During the argumentation stage of a dialogue, two parties (in the simplest case) take turns making moves that have the form of speech acts, like asking a question, making an assertion, or putting forward an argument. Dialogue protocols determine what types of moves are allowed (Walton and Krabbe, 1995). These will determine what kinds of arguments can be used during the argumentation stage, and hence also determine what argumentation schemes are appropriate to define these types of moves.

The six basic types of dialogue recognized by Walton and Krabbe are persuasion dialogue, inquiry, negotiation dialogue, information-seeking dialogue, deliberation, and eristic dialogue. Discovery dialogue has been added in the new list of the basic types of dialogue in Table 1.

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

Table 1: Seven Basic Types of Dialogue

The goal of a persuasion dialogue is to test the strongest arguments on both sides by pitting one against the other to resolve the initial conflict posed at the opening stage (Walton and Krabbe, 1995). Each side tries to carry out its task of proving its ultimate thesis to the proof standard required to produce a winning argument. The burden of persuasion set at the opening stage determines when a side has proved its ultimate thesis, thereby having prevailed over the other side. Each side must use a chain of argumentation in which individual arguments in the chain fit argumentation schemes appropriate for the dialogue.

The necessity for using not only normative models of dialogue but also conventionalized practices in which argumentation takes place, called *communicative activity types* has been recognized by van Eemeren (2010). In fact, in order to analyze and evaluate arguments it is often necessary to take into account that the argument takes place within accepted conventions and rules of special settings that we are all familiar with. For example, the relevance of an argument may have to be judged differently if that argument is to be used in a court case than if the same argument were to be used in forensic debate, or in a discussion about politics that people are having on the street. It would be too comprehensive to classify legal argumentation as an activity type, and in fact van Eemeren (2010, 140) recognizes special communicative activity types within the legal communicative domain, like court proceedings, arbitration and summoning. Similarly, subdivisions can be made of various communicative activity types in the political domain. A political interview and a televised political debate are given as concrete examples of activity types in the political domain (van Eemeren, 2010, 140). Among the other domains of communicative activity recognized are problem-solving communication, diplomatic communication, medical communication, scholarly communication, commercial communication, and interpersonal communication of the kind typified by making an apology or writing a love letter. Activity types are distinguished from each other by identifying the goals they are supposed to serve in order to function as species of communicative activity.

According to the theory of argumentation set out in van Eemeren (2010), there is only one normative model of dialogue, namely that of the critical discussion. In the theory set out in Walton and Krabbe (1995) there are six normative models of dialogue, as indicated in table 1 (excluding discovery dialogue). For an application of the pluralistic model to law, see (Sartor, 2007). There is another important difference between the two approaches. While deliberation and negotiation are classified as normative models of dialogue in the latter theory, in the former theory deliberation and negotiation are classified as activity types. On the approach of Walton and Krabbe, the critical discussion is classified as a species of persuasion dialogue.

Deliberation is markedly different from the other types of dialogue in that it represents a type of practical cognition in which practical reasoning is the dominant argumentation scheme (Walton et al., 2004). In deliberation, an agent or a group of agents needs to decide what to do in a situation where even doing nothing constitutes a course of action. Under these conditions, a choice must be made, even if there is a great deal of uncertainty. The costs of using time and resources to collect more information to lessen the uncertainty must always be balanced off against the costs of delay and the value of taking prompt action. If taking prompt action means making mistakes, it may also be possible to learn from these mistakes. In some situations, learning from one's mistakes is the best method for intelligently moving forward.

Similarly, in discovery dialogue very little may be known, but it might be much better to move ahead with a hypothesis, provided one is open to retracting it in the face of contrary evidence, than having no intelligent way to move forward at all. On the account given by McBurney and Parsons (2001, 4), the properties of discovery dialogue and inquiry dialogue are

different. In inquiry dialogue, the proposition that is to be proved true is designated at the opening stage, whereas in discovery dialogue the hypotheses to be tested are only formulated during the argumentation stage. A discovery dialogue moves through the following ten stages (McBurney and Parsons, 2001, 5): open dialogue, discuss purpose, share knowledge, discuss mechanisms, infer consequences, discuss criteria, assess consequences, discuss tests, propose conclusions, and close dialogue. The inquiry dialogue has a higher standard of proof, because the purpose of conducting the inquiry is to lessen the likelihood that the ultimate proposition proved at the closing stage may later have to be retracted. In a discovery dialogue, it is useful to put forward a hypothesis, even though it is very likely that it will have to be retracted at some point as the discovery dialogue proceeds. The assumption is that the hypothesis may ultimately be proved as there is a shift from the discovery dialogue to an inquiry, but the probability is that the hypothesis will have to be modified or even rejected as new evidence keeps coming in.

The goal of a persuasion dialogue is to reveal the strongest arguments on both sides by pitting one against the other to resolve the initial conflict posed at the opening stage. Each side tries to carry out its task of proving its ultimate thesis to the standard required, by producing arguments stronger than the ones produced by the other side. This burden of persuasion is set at the opening stage. Meeting one's burden of persuasion is determined by coming up with a strong enough argument using a chain of argumentation in which individual arguments in the chain are of the proper sort. To say that they are of the proper sort means that they fit argumentation schemes appropriate for the dialogue. 'Winning' means producing an argument that is strong enough to discharge the burden of persuasion set at the opening stage.

In the simplest sorts of normative models of dialogue put forward by Walton and Krabbe (1995) there are only two participants, the proponent and respondent, and both of them agree at the opening stage to abide by all the rules of the type of dialogue that they are participating in. This agreement to abide by the rules is accompanied by an agreement by both parties on what the goal of the dialogue is supposed to be. Only in the more recent literature are the simple two-party models being extended to cases where three parties or more are taking part in the dialogue, for example in a legal proceeding where there is a third participant (judge, jury, or arbiter) that determines the outcome of the dialogue based on the arguments put forward by the proponent and respondent. Also, these simple normative models represent ideals of rational argumentation that may or may not be met with in real cases of argumentative discussions. In a real discussion, some of the parties to the discussion might endorse and follow the goals and rules of the dialogue while others do not and will cheat, if given the opportunity.

6. Dialogues embedded in social practices

When a scheme is to be publicly used, within a dialogue pertaining to a particular social practice (such as legal discourse), the issue of the justification of the use of the scheme takes a different turn, and can be addressed at different levels. In general, for establishing whether to use an argument scheme S in a dialogue a party x may consider:

1. how much the use of the S by x is likely to lead x to appropriate epistemic or practical conclusions,
2. how much the use of the S by x is likely to advance x's goals in the dialogue,
3. how much the use of S by x is likely to advance to the goals (and values) underlying the dialogue itself and the practice in which it is embedded.

Assume for instance that *x* is a very religious person, pertaining to a religion based on sacred scriptures. Assume that he is consequently adopting the following scheme, which we may call *argument from sacred scriptures*:

Premise: It is asserted in the sacred scriptures that *A*
Conclusion: It is the case that *A*

The same person *x* may consistently give different answers to the three issues just listed with regard to this scheme, and act accordingly. Assume that *x* sincerely believes that the argument from sacred scriptures leads him to have true beliefs and correct practical determinations. Assume that *x* is considering a controversial issue, for instance whether abortion is morally permitted, and that he believes that the sacred scriptures contain a prohibition of abortion. Thus he can conclude in his private reasoning that indeed abortion is morally prohibited.

Premise: It is asserted in the sacred scriptures that [abortion is prohibited].
Conclusion: It is the case that [abortion is prohibited].

However, when engaging in a persuasion dialogues with his atheist friend *y*, *x* had better refrain from using an argument instantiating the scheme. Firstly, it is not likely to lead *x* to his purpose, which is that of convincing *y*. On the contrary, *y* may react negatively to this attempt to indoctrinate her and become more entrenched in her position.

Secondly, by using this scheme *x* will not contribute to the purpose of the persuasion dialogue, namely, coming to shared conclusions. On the contrary, the whole dialogue may collapse, since *y* may consider that *x* is not interested in appealing to her rationality, he is not respecting her as a free, equal and reasonable partner in the dialogical interaction. In fact, since *x* knows that one cannot be rationally convinced to adopt such a religiously based scheme (it is an article of faith); it could even be said that political morality requires that *x* does not adopt such a scheme in public reasoning where arguments must appear to be reasonable to everybody (Rawls, 1993).

The situation would be completely different in a case where *y* shares *x*'s faith, and accepts the argumentation scheme from sacred scripture. The use of the scheme would then be both an effective way on convincing *y* (if she can be persuaded that the sacred scriptures indeed contain, implicitly or explicitly, the proposition that abortion is prohibited), and a way that is consistent with the purpose of the persuasion dialogue.

We have considered the extreme case of argument from sacred scriptures to make our point, but similar consideration also apply to more secular argument schemes, in particular in legal contexts. For instance different legal systems make different (more or less extensive use) of the argument from precedent. For some of them, this argument can only be used in certain contexts, with particular constraints. For example, precedents traditionally are never cited by the French Supreme Courts, while courts of other legal cultures use them to a large extent. Traditionally, in civil law countries precedents can only be cited as reasons for interpreting a statutory text in a certain way; they do not provide reasons that directly justify a particular legal conclusion. In contrast, a binding precedent represents a defeasibly sufficient reason for a legal conclusion in a common law jurisdiction.

Similarly, in some legal cultures teleological reasoning in legal interpretations is admitted to a large extent, in other jurisdictions it is admitted to a lesser extent, namely, to the extent that it

refers to the purposes expressed or implied by the legislator. Here we cannot not engage in the comparative analysis of interpretation and precedent (on which see MacCormick and Summers1991, 1997), but we want just to make the point that the acceptability of arguments also is a social matter, being relative to the partners one is facing and the social context and cultural traditions in which one is acting.

The considerations we are developing do not merely concern the adoption of self-regarding goals, like convincing the other party to accept a choice that is useful for our purposes (for instance, convincing a colleague to take my place in a meeting). They also apply when one is pursuing a communal or impersonal value (e.g. getting to the truth in an inquiry, or making the best common choice in a deliberation), and also when one is pursuing the normative purpose of the dialogue one is engaged in. In fact, even when one is engaged towards common or impersonal values, endorsing the goals and norms of the dialogue, a difference needs to be made with regard the assessment of how the dialogues would ideally be executed (if everybody were endorsing the argument schemes that one considers to be more useful to achieve certain normative goals), and how the dialogue is going to be executed (given that not everybody is sharing the argument schemes one considers to be more useful).

The first, Kantian, attitude (develop your arguments according to those schemes whereby you can, at the same time, will that such schemes should become universal laws of rational discourse, in the kind of dialogue you are engaging in) may lead the dialogue to fail to achieve its purposes, when the participants in the dialogue (and more generally, the prevailing cultural assumptions) do not agree with one's assessment of what argument schemes would be most appropriate. Assume for instance that a lawyer believes that his legal system would become more just and effective if teleological reasoning was used to a larger extent (e.g., also for the pursuit of broadly and vaguely defined constitutional values), while the current legal culture limits the use of teleological reasoning by the judges (e.g. linking it to goals endorsed by legislators). Under such conditions a judge's engagement in unrestrained teleological reasoning is not likely to produce the outcomes that the judge would like his legal systems to achieve (better realization of constitutional values), but would only produce legal uncertainty.

This issue is most relevant in those contexts such as the law, where argumentative practices play to some extent a constitutive role with regard to their object. A legal system where judges decide cases by engaging in teleological reasoning with regard to broad constitutional values is different from a legal system where judges mostly do not depart from the literal interpretation of the statutory law. Thus a change in argumentative practice, rather than being viewed only as a change in ways of cognizing an existing object (the legal system), may be viewed as a change in that object, a change that has to be appreciated as such (on the constitutive role of argumentative practices, see Patterson, 1999), taking into account the political and institutional implications involved. For instance, a preference for teleological arguments referring to constitutional values over arguments based on legislative intentions involves a shift of power from legislators to judges. Moreover, the adoption of a certain argumentation scheme (or its priority over another argumentation scheme) can only be evaluated by taking into account the whole argumentative practice pertaining to legal problem-solving, and the way in which that argumentation scheme interacts with others. For instance, the idea that teleological arguments with regard to constitutional values are to be preferred over arguments based on precedents has a different impact in a system where precedent is binding, and such an impact may be differently appreciated taking into account the organization, the education and the skills of judges.

We distinguish three kinds of assessment with respect to the decision on whether to use a certain scheme in dialogue embedded in a social setting:

1. A scheme is individualistically recommendable if using it contributes to the purposes of the player.
2. A scheme is dialogically permissible if allowing its use does not endanger the purpose of the dialogue.
3. A scheme is dialogically recommendable if using it positively contributes to the purposes of the dialogue.

Whether a scheme satisfies these requirements depends on the kind of dialogue (as we have seen in section 5 above), but also on the particular position of a party in the dialogue and on the social context in which the dialogue is taking place.

For instance, because of the powerful effect of this type of argument on a jury, it might be highly strategically advantageous for a prosecutor to bring in character evidence relating to the defendant, for example of his past cruel behavior (even if the evidence is weak and the facts only marginally relevant). This evidence however may fail to be dialogically permissible, since it may endanger one of the purposes of the judicial dialogue, i.e., coming to true assessment of the facts of the case. In fact it may prejudice a jury against the defendant, leading to an unjust conviction. Thus the prosecutor may be facing a dilemma: whether to bring forward this evidence, making it more likely that he will win the case, improving his popularity (which would be good for his self-interest), or whether not to bring it forward, which will be good for the unbiased exercise of justice.

Similarly, by bringing forward ethotic arguments in a persuasion dialogue with a party one dislikes, one may succeed in his purpose (discrediting the adversary), but will fail the purpose of the dialogue (convincing the other party), and thus the move is dialogically impermissible. Such arguments, moreover, are likely to fail to contribute to coming to true factual assessments and appropriate practical determinations, thus being inappropriate also under the monological perspective.

Moreover, as the examples above show, sometimes one may refrain from using the schemes one would like to see practiced by everybody for the sake of reaching an agreement, or at least a certain degree of convergence. This may happen on self-regarding strategic grounds. When one's purpose is that of convincing the other party, it is useless to bring forward argument schemes the other party rejects. However, it may also happen on grounds pertaining to dialogical permissibility. If the purpose of the dialogical interaction is that of preserving or developing a certain agreement within a common culture, then a party should refrain on this ground from doing what may appear to be unacceptable to the other parties. Finally, there may be the situation (as in a judicial dispute) where a reasoner may refrain from using certain kind of reasoning in a dialogue, in consideration of the social function the dialogue has, and its impact on social values (such as legal certainty).

The importance of agreement and (dynamical) convergence is more important however, in certain contexts than in others. For instance, in the law a much higher level of disagreement can and should exist in judicial decision making than in academic debate. Judicial argument can be seen as part of a persuasion dialogue, inspired by the need to come to a shared view of the law, where the parties, as well as other judges and citizenry, are invited to accept the motivation put forward by the judge. In contrast, academic debate can be viewed as an instance of inquiry, in

which new ideas and intuitions are put forward as possible objects of investigation. Thus the constraints that legal culture and existing attitudes put on argumentation schemes in doctrinal debates appear to be inferior to those applying to judicial argument.

7. A game-theoretical analysis

Let us now use elementary game theory to model the situation of a party who would like to use an argument scheme that is not viewed as acceptable by his or her counterpart (and in general by the social context where that particular dialogue is embedded). For instance, assume that what we called argument from sacred scriptures, would easily enable Mother to convince Son of his duty of obedience, if Son accepted this argument scheme (given that the sacred scriptures under consideration uncontestably contain the children's duty to obey their parents), but that Son does not accept the scheme, being an atheist. Assume also that Mother may use another reasoning to support her request for obedience. She could use an argument from consequences, saying that it would be useful for Son to obey, given that Mother is likely to give him good directions (given her superior experience and her commitment to Son's welfare), but this argument would only support a more limited claim to obedience. We can represent that in the following table, where rows represent Mother's choices and columns Son's choices. Each cell at the intersection of a row and a column indicates the payoffs Mother and Son would respectively obtain, for the corresponding profile (combination of choices).

Mother\Son	*A.* Accept argument from sacred scriptures	*B.* Accept only argument from consequences
A. Use argument from sacred scriptures	2, 0	0, 1
B. Use argument from consequences	1, 0	1, 1

Table 2: The choice of a scheme in a Strategic Setting

Mother would prefer profile *<A, A>*, where she uses the argument from sacred scriptures and Son accepts it, since in this case Mother would succeed in convincing Son of his duty of full obedience). Her preference is expressed in the matrix (in the cell where the *A* row and the *A* column intersect) by payoff-value 2 for Mother. However, Son dislikes this argument scheme (payoff 0), since accepting it would go against his atheistic conviction. For him the best choice is to accept only the argument scheme from consequences (*B*), whatever argument scheme Mother uses (this is expressed by the fact that he values 1 both profiles *<A, B>* and *<B, B>*). If Mother uses the argument from sacred scripture, then Son will reject it, which means that she will fail to convince him (the worst outcome for her, as indicated by the 0 payoff). The best choice for Mother is to use the argument from consequences, which Son will accept, and which will enable her to convince him to provide a moderate obedience (which she values positively, as expressed by her payoff 1 in cell *<B, B>*). It can easily be shown that the profile *<B, B>* where Mother uses and Son accepts the argument from consequences is the only Nash equilibrium of this game (neither Mother nor Son would do better by unilaterally changing their strategy).

Let us now move into a legal setting. Assume that for instance there is a case concerning medical liability. The two parties agree that Patient has been damaged through the negligent behavior of Doctor. The issue is the amount of compensation. Patient argues that to achieve the

constitutional value of the protection of health, full compensation is required, including moral damage (suffering), while Doctor is ready to pay only the financial damage suffered by Patient, as established by ordinary legislation. Assume that the two parties are acting in the context of a legal culture that does not admit the justification of a decision by direct teleological reference to a constitutional value.

Let us consider first the position of Patient (the damaged party). For Patient the most convenient approach is to put forward both arguments, the value-based practical argument based on the constitutional right to health (asking for full compensation) and the rule-based argument based on the statutory rule granting compensation for financial damages, hoping that Judge will possibly accept the first arguments (even though there is only a very little chance that this will happen).

The position of Judge is different. Judge is addressing an audience including not only the parties to the case but also her colleagues and the community as a whole, and she cannot accept both arguments, since they lead to incompatible conclusions. Assume that Judge would prefer that direct teleological arguments from constitutional values were accepted in her legal community, but that in her legal community a different attitude is prevalent: the shared view is that it is up to the legislature to implement constitutional rights, the constitution having the only function of constraining legislative or administrative action. Assume also that for Judge it is very important to make a choice consistent with what her colleagues would do in the same situation (and will do in similar cases), for the sake of consistency and certainty (and also to maintain his reputation of a reliable judge, whose decisions are not often overturned or overruled).

This game Judge is playing with Colleagues is represented in table 3.

Judge\Colleagues	Scheme A	Scheme B
Scheme A (constitutional teleological argument)	2, 1	0.2, 1.9
Scheme B (rule-based statutory argument)	1.9 , 0.1	1, 2

Table 3: The Judicial Choice of an Argument Scheme

Judge would prefer the profile <A, A>, the situation where everybody (both Judge and Colleagues) uses reasoning scheme A (*constitutional teleological argument*) to address this kind of case, granting full compensation to damaged patients (Judge's preference is reflected in the matrix by a payoff-value 2). Colleagues' assessment however is different: they moderately dislike profile <A, A> (as indicated by a payoff-value 1), since they do not approve this kind of judicial activism (but they appreciate the consistency involved given the fact that all the judges, in this situation, would act in the same way). The profile Colleagues would prefer is <B, B>, where everybody sticks to the rule-based statutory argument. While Judge moderately dislikes this profile (in which the parties do not obtain the compensation she believes they should get), both consistency and certainty are preserved.

Consider now profile <*A, B*> , where Judge chooses to go against the preferences of Colleagues by playing *A*, where the others stick to *B*. Judge dislikes this profile, both on personal (self-regarding) grounds and on communal (value-based) grounds: on the one hand her reputation will suffer since her decision will be considered wrong and disrespectful of the law; on the other hand she will contribute to legal uncertainty, without succeeding in changing the law (this is expressed by a payoff of 0.2). Colleagues would prefer total convergence on *B*, but the presence of one dissenting voice makes little difference to them (this is reflected by associating <*A, B*> with a payoff of 1.9 for Colleagues). Given these preferences, the dominant choice for Colleagues is to stick to scheme *B* (which gives them a higher payoff that *A*, whatever Judge does). Thus, the choice of Judge is restricted to being the only dissenter when the others play *B* (profile <*A, B*>), or to join the others in *B* (profile <*B, B*>). The latter choice (which at least preserves consistency) is preferable to Judge, as expressed in the matrix by payoff 1 rather than 0.2. It is easy to see that <*B, B*> is the only Nash equilibrium.

Thus, the example shows how Judge should rationally depart from the Kantian paradigm (using the argument scheme she would prefer were used by everybody), and choose an argument scheme acceptable to her colleagues, for the sake of converging with them. By doing so she contributes to realizing a profile she views as suboptimal, but which is still better than any alternatives available to her.

8. Bootstrapping the justification of schemes

In section 5 we affirmed that argumentation schemes need to be justified on a basis of how well they serve the needs of different practical or epistemic activity types. Each of these activity types provides goals that require appropriate means, represented by the kinds of arguments that are relevant for fulfilling these goals. Our justification of schemes proceeds by teleological reasoning, that is, by showing that such schemes are adequate means to achieve the goals of the concerned activity type, in the social setting in which it is practiced. We could not use argumentation in these types of activities without relying on arguments of the various kinds we have identified, especially the practical reasoning type of argument. But we cannot properly identify, analyze and evaluate these arguments without using the normative models in conjunction with burdens and standards of proof. The relationship of the components of our justification of schemes is shown in figure 1.
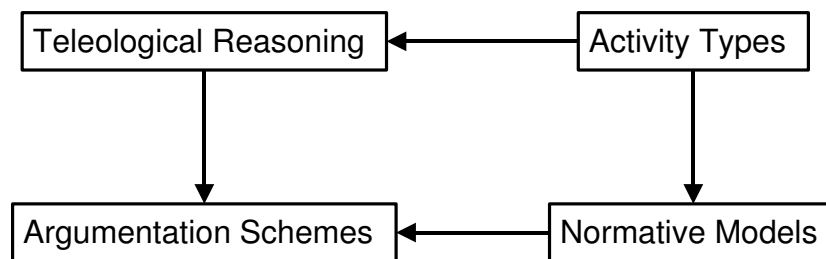

Figure 1: Relationship of Components of Justification System

Examining the process of justification shown in figure 1, we see that it is not circular, but it has a closed structure and is not linear or tree-like. The activity types are the basis of the justification

system. They show that teleological reasoning is central, and that this kind of reasoning needs not only to be represented by an argumentation scheme, but is itself a scheme. However, by itself this part of the process is insufficient to justify schemes. Ultimately, in order to apply a scheme to a real argument fitting an activity type we need the goals, standards and protocols of the normative models of that activity type, in a certain dialogical and social context.

The justification of inference schemes is something that pertains first of all to the concerned agents. Thus it must consist in reasons that appeal to them. However, what counts as a reason is established by the reflexive application of the available argument schemes. Thus it may seem that we are captured in an inescapable loop: we need argument schemes to justify our argument schemes. Some circularity is indeed inevitable, if we want to avoid falling into an infinite regress (postulating an infinite number of inference scheme, each justifying another), or to postulate some inference scheme as foundationally unchallengeable. We think however, that we may try to pursue an intermediate way, namely to identify some basic inference schemes, that appeal to everybody's intuition, and indeed may be viewed as inborn skills of each human being (and maybe of every rational being, or at least of any rational being having a human-like kind of rationality). On top of these argument schemes, other schemes may be adopted, thanks to social conditioning, education, or individual choice.

It seems to us that the five Pollock's schemes for defeasible reasoning (section 1 above), in combination which deductive and probabilistic inferences, can provide the concerned agent with sufficient reasoning resources to bootstrap the adoption of further argument schemes, like those in the broader list in Section 2 and the other more specific schemes we have been mentioning. For this purpose we need to apply those argument schemes to input information consisting of general underlying assumption of human interaction and current social practices.

Pollock's planning scheme cited in section 1 is what a careful enough person uses when reasoning. In general, it would imprudent for an agent to endorse the defeasible choice of carrying out action A to achieve goal G without believing that this is an improvement over the current situation, taking into account also A's side effects. However, this scheme may support the adoption of more liberal kinds of arguments for teleological reasoning, such as the argument from consequences introduced in section 1 above. In fact in carrying out a deliberation dialogue we can and indeed should be more flexible than in solitary teleological reasoning since within such a dialogue on the one hand one party's argument does not entail yet a commitment to action (a joint decision being required for that), and on the other hand there is the need to share with our partners our ideas on how to address the issue at stake, as candidate solutions to be discussed. Thus the argument for consequence provides an appropriate pattern, which enables us to say in a dialogue "we should do A to achieve G", without having checked A for side effects, as a way of bringing up the idea of doing A for discussion. By applying Pollock's planning argument as our bootstrapping form of teleological reasoning, and considering the goal of stimulating the deliberative debate, we can indeed conclude that in deliberation dialogues we need to relax our schemes for teleological reasoning, by transforming what is a precondition in monological teleology (improving the situation), into a critical question (and its negation a defeater) in spoken argumentation. Thus, Pollock's scheme for teleological reasoning (planning) takes this form.

If A contributes to goal G, and doing A improves on current situation, then I should do A.

When applied to the goal of improving the effectiveness of deliberation, authorizes us to adopt a different, more relaxed, scheme for teleological reasoning in dialogue (argument from consequences).

If *A* contributes to goal *G*, then *A* should be carried out (by the concerned agents).

Matching the second scheme we can have '*A* has negative consequences' as a defeater or 'Are there negative consequences of carrying out *A*?' as a critical question. This much said, it is also possible use the argument for consequences also in monological reasoning by playing devil's advocate in solitary deliberation, i.e., by asking yourself about the most plausible objections to carrying out a particular action that you are thinking about.

From Pollock's scheme for planning we can similarly bootstrap to the justification of the argumentation scheme argument from expert opinion. To justify the scheme of argument from expert opinion, we need to establish that the plan to use this scheme is indeed minimally good, i.e., that the expected utility of using it (individually or in a dialogue) is higher than the utility of not adopting it.

For monological utility we need to establish that the use of the scheme is truth-conducive and that truth is useful. The first aspect (truth conduciveness) can be established by pointing to the causal connection between expertise and having true beliefs, and to the fact that people usually say what they believe. The second aspect (utility of truth) can be established by considering (on the basis of induction and statistical syllogism) that choices based on true beliefs usually lead an agent capable of planning to useful outcomes. To be useful in a dialogue the scheme also needs to be acceptable to our dialogue partners. Again, this can be supported through experience (perception), induction and statistical syllogism. Obviously, we need temporal projection to extend the result of these inferences up to the time when the justified scheme is to be used.

Finally, utility can be understood in different ways, as being focused on the personal interest of the agent involved in a dialogue, or rather on the communal interest in having appropriate dialectical institutions, for which purpose a normative theory must be presupposed.

9. Conclusions

We showed how argument schemes fit a general form of argument called *defeasible modus ponens*, so that they can be given a common logical structure, as defeasible conditionals, in the framework provided by logics for defeasible reasoning. The availability of this logical model still does not provide a justification for the use of particular argument schemes, like the twenty-five introduced in Section 1, since a justification needs to be provided for each defeasible conditional corresponding to a scheme. We have thus argued that the use of argument schemes should be given a pragmatic justification, namely, a justification that is based on teleological reasoning, as instantiated by the scheme for practical reasoning, supplemented by the arguments from positive and negative consequences: a schemes need to be shown to be relevant and useful for normative models of argumentation. These normative models are abstract species of goal-directed activities in which rational agents try to work together to find the truth of the matter or make a reasonable decision on how best to proceed in circumstances that call for a choice of action. We showed how this kind of reasoning can be seen as a species of agent-based teleological reasoning, and we outlined the capacity that an agent needs to posses to successfully engage in such a form of reasoning. We have also shown that one further capacity, namely reflexivity is needed for the

agent to be able to apply teleological reasoning to its own argument schemes. Our justification of the use of schemes is based on a conception of reasoning compatible with this architecture for reasoning.

We considered the social dimension of reasoning, namely, the fact that argument schemes are ways of acting in a dialogical and social context, governed by normative models of dialogues and activity types. We showed how these models provide goals and rules that govern argumentation, and thereby provide contexts of proper use within which schemes have to be used and justified. Thus we argued that in constructing a teleological justification of the use of an argument scheme, the goals and rules of such normative models have to be considered, together with the attitudes of the dialogue partners, and the cultural and social setting in which the dialogue is taking place. We distinguished three kinds of assessment with respect to the decision on whether to use a certain scheme in dialogue embedded in a social setting. We also showed by examples that sometimes one may refrain from using the schemes one would like to see practiced by everybody for the sake of reaching an agreement, or at least a certain degree of convergence.

We considered the use of argument schemes in three kinds of activity, everyday deliberation, scientific hypothesis formation and legal trials. We connected the use of defeasible inference to burdens of proof. Argumentation schemes apply to particular arguments put forward during the argumentation stage of the dialogue. Whether an argument that fits a scheme is acceptable or not depends on the burden of proof, and especially the standard of proof within that burden of proof, that applies at that stage in the sequence of argumentation. What this means is that an argument does not have to be deductively valid, nor does it have to have premises that are proven beyond a doubt, in order to make it a justifiable, useful and acceptable argument to put forward at some point during argumentation activities. By shifting a burden of proof to encourage the other side to put forward the strongest possible arguments to defend its contention, the aims of the investigation can be moved forward, and it is this moving forward that justifies the use of argumentation schemes. We provided a game-theoretical analysis of the strategic dimension involved in using argument schemes and drew out its implications for uses of schemes in legal argumentation.

Another thing we showed is that the criterion of relevance is an important factor in the justification of the use of argumentation schemes in all the three basic kinds of argumentation activities we began by considering. Even more generally, the use of a particular argumentation scheme is only justified if this kind of argumentation is relevant in that it supports the goals and values of the type of activity concerned.

Finally we discussed how to bootstrap the justification of argument schemes using the schemes for teleological argument, given that the justification of a scheme requires showing that it is an adequate means to achieve the goals of the concerned activity type, in the social setting in which it is practiced. We argued that for bootstrapping justification it is sufficient to adopt a minimal basic set of argument schemes, which may be viewed as constant elements of human rationality (such as the five basic schemes provided by John Pollock).

Thus it is up to human rationality to extend the set of available argument schemes, as useful and socially shared reasoning patterns. Consequently, we would argue, the set of valuable argument schemes is inherently open, and its development pertains to human ingenuity coupled with social learning. Argumentation schemes, as we showed, need to be justified according to teleological arguments within normative models of dialogue and communicative activity types, and cannot escape the critical assessment provided by the same kind of arguments, where they

can also be shown in some instances, when employed improperly, to detract from rather than contribute to individual and social rationality.

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