Epistemic Norms

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Some Intuitions

Epistemic normativity already appears at a simpler and lower level of reasoning. For instance, everyone observes the effects of gravitation at every moment of their daily lives and concludes that whenever they drop something, it will fall.

We believe this conclusion and use it in our reasoning, when, for instance, someone tells us that she dropped a glass, then we conclude, based on our belief, that the glass fell. Let us now make it clear how epistemic norms are involved in this basic example. First, we use a kind of induction to infer that objects fall when they are dropped from a height. Second, by a kind of (intuitionisticly flavoured) deduction, we conclude that the next object, i.e. the glass, *will* fall down as well. These epistemic norms of induction and deduction are tools which guide our belief.

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Singer's Example

Assume that on your way to your department at university, there is a small pond, and one day you see that a small child has fallen in it and is drowning. Clearly, no one can deny that you have an obligation to save the child even if it gets your clothes muddy and delays you from work: "If it is in our power to prevent something very bad from happening, without thereby sacrificing anything of comparable moral significance, we ought to do it" (Singer, 1993). Following Singer's example, extreme poverty is bad and it is in our power to reduce it "without sacrificing anything of comparable moral significance". Yet, we do not usually seem to spend sufficient effort to reduce the world's poverty even though, to some extent, it is in our power to reduce it.

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Singer's Example: Objections

In the pond example, we *know* that the child is about to drown. Thus, the knowledge of this situation triggers our action by imposing the obligation. On the other hand, when poverty in Africa is considered, we usually do not know that a specific person in a specific town is in extreme poverty even though we consider it epistemically likely or epistemically possible that, say, someone in Sudan is malnourished (Singer, 1997). Therefore, these two situations impose different types of obligations. The first obligation follows from a definitive knowledge of the event whereas in the second obligation, we do not possess the (full) knowledge of the situation. It is beyond our capacity to possess the full knowledge of the problem of world's poverty. The it may be claimed that we do not have any obligation in the

absence of the relevant knowledge

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Singer's Example: Objections

We can still ask the following question. Even if we have the full knowledge of a situation and its predictable short term effects, does this always generate an obligation? Peter Unger raises the issue that lack of full knowledge of the *outcome* of the action may create some hesitation in the implementation of the action (Unger, 1996). Even if we know that charitable giving can save some lives, we do not always send money to such charities, and thus *let other people die* as a possible indirect result of our action [ibid].



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A Definition

Epistemic norms are those norms which describe if it is epistemically permissible to hold various beliefs (Pollock, 1987). This is a narrow definition - yet, it works for our purposes here. Following classification will help to picture epistemic normativity better.



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A Classification

- Rule based or not (Boghossian, 2008; Engel, 2007; Horwich, 2008)
- Internalist or Externalist (BonJour & Sosa, 2003; Conee & Feldman, 2001; Pollock, 1987; Swinburne, 2001)
- Foundationalist or Coherentist (Swinburne, 2001)



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A Classification

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- Rule based or not (Boghossian, 2008; Engel, 2007; Horwich, 2008)
- Internalist or Externalist (BonJour & Sosa, 2003; Conee & Feldman, 2001; Pollock, 1987; Swinburne, 2001)
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Internalism

Internalists hold that the degree to which a belief is justified is a function exclusively of the internal states of the believer. Thus, beliefs are justified only by things that are internal to the person's mental states (mentalism).

Internalists hold that whatever makes for justification is itself accessible to the reasoner by introspection.



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Externalism

Externalists maintain that more than the believer's internal states can be relevant to the justifiedness of his beliefs (Pollock, 1987). Belief externalism suggest that our norms should be formulated in terms of external considerations while norm externalism claims that our norms are internal but external considerations are employed in the selection of these norms.



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Foundationalism and Coherentism

Foundationalists maintain that beliefs are based on basic beliefs which are justificatory foundations and are not derived from other beliefs.

Epistemic coherentism is the view that belief consists in its cohering with the person's other beliefs. (Swinburne, 2001).



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Do They Exist?

Do we have a set of norms that govern our reasoning? Among many others, Boghossian has adressed precisely this question (Boghossian, 2008). Boghossian distinguishes two types of such rules: imperatives and normative propositions. The main difference between the two is that normative propositions have truth values while imperatives do not. An example of a normative proposition would be "If it is cloudy, then you are epistemically permitted to believe that it is going to rain". On other hand, an example of an imperative proposition "If it is cloudy, believe that it is going to rain". For Boghossian, epistemic norms are neither propositional nor imperatives; yet, he does not consider the possibility of having a mix of both.

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On Norms

How Do They Regulate Beliefs? I

Pollock argues that epistemic norms "describe an internalized pattern of behavior that we automatically follow in reasoning" (Pollock, 1987). The way we automatically follow them is through "internal states" which are "states that are directly accessible to the mechanisms in our central nerve system that direct our reasoning" [ibid].

Pollock discusses the example of riding a bike. Our knowledge of riding a bike is normative - among many others, gravitation and traffic rules, for instance, govern it. Yet, the rider does not think what to do when, say, the bike leans right. Pollock contrasts this idea with what he calls the intellectualist model.

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How Do They Regulate Beliefs? II

For him intellectualism means "doing it by the book" which implies that our epistemic norms are explicitly articulated and can be considered as a reference manual which contains full information about how to act in all possible circumstances. This automatic functioning of epistemic norms can also be contrasted with the way moral norms regulate. Because, unlike epistemic norms, moral norms play the rôle of a negativist and a correctionist guide to action.



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To What Degree Are Beliefs Voluntary?

Doxastic voluntarism is the view that our beliefs are voluntary and that we can control them (Feldman, 1988). The significance of (doxastic) voluntarism for our purposes is its obvious connection with reasoner's responsibility over his beliefs and actions. The following simple argument, which has been dubbed "The Voluntarism Argument" by Feldman has been endorsed by several philosophers (Alston, 1988; Feldman, 1988; Plantinga, 1988). We quote from Feldman the following schema (Feldman, 1988).

- 1. Doxastic voluntarism is false.
- 2. If doxastic voluntarism is false, then no one has epistemic obligations.
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3. Therefore, no one has epistemic obligations.

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Voluntarism: Objections I

At first sight, this argument seems sound and plausible: I cannot control believing that what I see in front of me is the screen of my computer, so I cannot be held responsible for this belief. However, several objections can be raised to this argument and some have been summarized in (Feldman, 1988). First, one could simply maintain that beliefs *are* voluntary and therefore disagree with (1). A more subtle reason for rejecting (1) has been proposed by Heil who claims that even though we may not be able to control our beliefs directly, we can control them *indirectly* by performing actions that lead us to alter the way we form beliefs (Heil, 1983).

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Voluntarism: Objections II

We agree with Feldman that there is a distinction between epistemic obligations to believe something (right now) and obligations to take actions to obtain evidence. Perhaps the indirect control of Heil is not sufficient for the existence of epistemic obligations of the former kind.

Apart from rejecting (1), also (2) can and has been criticized. As Feldman mentions, one could reject (2) by maintaining that obligations pertain to actions rather than belief states (Feldman, 1988).



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Voluntarism: Objections III

Feldman himself endorses a different objection to the voluntarism argument. Namely, he rejects (2) by claiming that we *can* have obligations concerning involuntary beliefs in the same way as we can have a legal obligation to pay our mortgage even if our financial situation no longer allows for this. Thus, according to Feldman, the famous "Ought" does not imply "Can" anymore, at least in the case of epistemic obligations.

In a fairly recent article, Weatherson also discusses the voluntarism argument (Weatherson, 2007). Contrary to Feldman, Weatherson agrees with (2) but attempts to refute the argument by rejecting (1). He claims that there are two kinds of beliefs: perceptual and inferential ones.

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Voluntarism: Objections IV

The preceptual beliefs are spontaneous and involuntary while the inferential beliefs, the ones that involve *reasoning*, are voluntary "in that we have the capacity to check them by paying greater heed to counter-possibilities" [ibid]. Involuntary or perceptual beliefs, Weatherson argues, are best evaluated using externalist standards like reliability. Beliefs that involve reasoning on the other hand, are justified only when "well supported by reasons" [ibid].



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Alief I

Gendler distinguishes two kinds of beliefs: *belief* and *alief* (Gendler, 2008). The author cites several psychological experiments that she uses to address this distinction: people who are hesitant to drink a glass of juice with a completely sterilized dead cockroach in it or people who hesitate to wear a laundered shirt which was previously worn by a person they dislike. In such cases, as Gendler points out, "they *believe* that the items in question are harmless, they also *alieve* something very different", namely, that those objects are "filthy" and those people felt that they should "stay away" from them (Gendler, 2008).



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This distinction accounts for the belief - action mismatch in some situations. In other words, we believe that the aforementioned glass of juice is harmless, but we alieve that it is filthy. The action of avoiding that glass of juice is caused by the alief in this case, not by the belief. This issue indirectly brings along the concept of alief revision. If we alieve p, and then learn not-p, what happens then? Gendler addresses this question, but does not provide a full and convincing answer akin to the famous discussions on belief revision.



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Belief Polarization I

Discussions on beliefs can still shed some light on epistemic normativity. For instance, in his compelling essay, Kelly discusses the notion of *belief polarization* (Kelly, 2008). Belief polarization is the situation where two agents disagree on a nontrivial issue and later on when they both are exposed to the same evidence, their positions diverge further. The example that Kelly discusses is the matter of capital punishment.

Let us say A thinks that capital punishment has a deterrent effect on the commission of murder while B thinks otherwise. Then, they both are shown the same body of evidence, say some statistical data which is of mixed character.

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Belief Polarization II

Among the given statistical data, some studies demonstrate the benefits of the existence of capital punishment, and some suggest that there is no benefit of it to prevent crime. Then the crucial question that Kelly asks is "What becomes of our initial disagreement once we are exposed to such evidence?". He claims that "exposure to evidence of a mixed character does not typically narrow the gap between those who hold opposed views at the outset". This is exactly how he defines "belief polarization". Kelly, furthermore, gives some possible explanations for this phenomenon.



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Belief Polarization III

First, he discusses Kripkean dogmatism which is the idea that people ignore evidence counter to their originally held belief. A counter argument to Kripkean dogmatism is the experimental observation that we do pay more attention to the counter evidence we are faced with it [ibid]. The second explanation, which accounts for this fact, is the simple idea that people are better at detecting a "fallacy [which] occurs in an argument for a conclusion which they disbelieve" [ibid]. The last explanation that Kelly gives for belief polarization is his suggestion that we tend to "devote more thought to evidence which seems to tell against our beliefs than to evidence which seems to tell in their favor" [ibid].

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Belief Polarization IV

Kelly, furthermore discusses the normative aspects of belief polarization. For him, the reasoner is perfectly reasonable if she faces evidence that might have been shaped by some distorting factors, provided of course that the reasoner was unaware of these factors.



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Knowledge Based Obligations: Basics

In their paper Pacuit, Parikh and Cogan (PPC henceforth) also formalize obligations to act under uncertainty (Pacuit *et al.*, 2006). Even though their model accounts for uncertainty of outcomes of actions, their main focus is on uncertainty of the *circumstances*. In order to choose responsibly, they argue, one needs sufficient knowledge about the circumstances. A motivating example that is used is the following.

Example

Uma is a physician whose neighbor is ill. Uma does not know and has not been informed. Uma has no obligation (as yet) to treat neighbour.

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Knowledge Based Obligations: Formalism I

In the PPC framework, actions are also events. An action *a* can be performed at a finite history and yields a set a(H) of global extensions of *H*. Formally, we have $a(H) = \{H' | Ha \sqsubseteq H'\}$ where \sqsubseteq is the initial segment relation. Note that in PPC's (original) framework agents move sequentially.

In order to formalize *obligations*, a notion of *H*-good histories G(H) is introduced. G(H) is defined as the set of extensions of the finite history *H* with the highest possible value. Thus, the set of *H*-good histories is actually the set of *H*-optimal ones. Given this notion of *H*-goodness, an action *a* is defined to be good if and only if $G(H) \subseteq a(H)$, i.e. every *H*-good history involves performing a

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Knowledge Based Obligations: Formalism II

Note that this does *not* imply that performing *a* guarantees an *H*-good future. Finally, the PPC notion of obligation is as follows:

Definition

An agent α is obliged to perform an action a at global history H and moment m iff a is an action which α (only) can perform, and α knows that it is good to perform a. Formally, $(\forall H')(H_m \sim_{\alpha} H'_m \text{ and } H' \in G(H'_m) \text{ implies } H' \in a(H'_m)).$



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Knowingly Doing I

Broersen presents a logical study of the interaction between 'ought-to-do' and 'knowingly' or 'consciously' doing (Broersen, 2008). Broersen introduces epistemic modalities within a deontic STIT logic. While PPC focus on the way knowledge states *imply* certain obligations and how changes in an agent's information state *lead* to changes in his obigations, Broersen focuses on the epistemic conditions in which an agent can *comply with* or *violate* an obligation. The model can be described briefly as follows. Broersen uses a STIT framework of actions with, in addition, an indistinguishability equivalence relation for each agent between history/moment indices. Actions, in Broersen's model, take effect at the next moment in time.

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Knowingly Doing II

The concept of *knowingly doing* is defined as follows. An agent knowingly does something if its action 'holds' for all the history/state indices in the epistemic equivalence set containing the actual history/state index. Within this epistemic model action model, Broersen introduces the following STIT operator $[\alpha \ xstit]\varphi$ with the intuitive interpretation that agent α sees to it that in the next state φ holds.

A personal epistemic ought operator $O[\alpha \ xstit]\varphi$ is defined as follows:

$$O[\alpha \ \textit{xstit}]\varphi = \Box(\neg[\alpha \ \textit{xstit}]\varphi \rightarrow [\alpha \ \textit{xstit}]V)$$

where V is a 'violation constant denoting that a violation occurs



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Knowingly Doing III

Also, $\neg[\alpha xstit]\varphi$ expresses that α does not see to it that φ and thus allows a choice with possible outcome $\neg\varphi$. The intuition behind the above definition is that agent α ought to see to it that φ if and only if, by not seeing to it, he allows a violation. According to Broersen, simply seeing to it that φ is not enough to comply with the obligation to see to it that φ . Instead, Broersen proposes, an agent should perform the action *knowingly* in order to avoid violation. Formally:

$$OK[\alpha \ xstit]\varphi = \Box(\neg K_{\alpha} \ xstit\varphi \rightarrow [\alpha \ xstit]V)$$



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Deontic Dynamic Epistemology: Basics I

The language of public announcement logic equipped with permissibility operator (PPAL, for short) is that of basic public announcement logic extended with another operator $P(\psi, \varphi)$ which reads "after ψ has been publicly announced, it is permitted to say φ ". Therefore the language of PPAL is constructed recursively as follows.

$$\varphi := \bot \mid p \mid \neg \varphi \mid \psi \lor \varphi \mid K_i \varphi \mid [\psi] \varphi \mid P(\psi, \varphi)$$

for the propositional variable p and subscript i is in N - the set of agents. Recall that the formula $[\psi]\varphi$ reads "after ψ is publicly and truthfully announced, φ is true". The dual of $[\cdot]$ is defined in the usual sense and denoted as $\langle \cdot \rangle$.

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Deontic Dynamic Epistemology: Axioms

Now, we can discuss the semantics of PPAL. The semantics of Booleans and the epistemic modality are clear.

$$\begin{array}{ll} M,s \models K_i \varphi & \textit{iff} \quad M,t \models \varphi \textit{ for all } (s,t) \in R_i \\ M,s \models [\psi] \varphi & \textit{iff} \quad M,s \models \psi \Rightarrow M_{\psi},s \models \varphi \\ M,s \models P(\psi,\varphi) & \textit{iff} \quad (s,|\psi|_M,|\langle\psi\rangle\varphi|_M) \in D \end{array}$$

where $(s, S_1, S_2) \in D$ means that "at state s, the announcement that restricts the set of all possible states to S_1 will do in such a way that any further announcement that restrict the set of all possible states to S_2 will become permitted" and $|\varphi|_M$ is the extension of φ in the model M.

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Coalition Epistemic Dynamic Logic I

The two-sorted language will have a set of atomic propositions, atomic actions; and furthermore we will have a a set of agents A. The set Δ will denote the set of all joint actions available for all the agents, and the set Δ^* will denote the set of all partial joint actions available for, possibly all or some, agents. For $\delta \in \Delta$, and G being a set of agents, we will then have partial actions of the form $\delta|_G = \{(i, a) \in \delta : i \in G\}$ where each agent *i* is supposed to perform one action. For instance, joint actions of the form $\{(i_1, a_1), \dots, (i_n, a_n)\}$ will mean that "the agents i_1, \dots, i_n execute their respective actions a_1, \ldots, a_n simultaneously" while we do not consider what the other agents in A do at that time.

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Coalition Epistemic Dynamic Logic II

The models of CEDL will have the form $\langle W, \{K_i\}_{i \in A}, \{T_{\delta|_G}\}_{\delta|_G \in \Delta^*}, V \rangle$ where W is a non-empty set of states, T is a relation defined for each $\delta|_G$ producing an ordered tuple of states, and V is a valuation function. The language of CEDL is given as follows.

$$\varphi := p \mid \neg \varphi \mid \psi \lor \varphi \mid \mathsf{K}_i \varphi \mid [\delta|_G] \varphi$$

for atomic p and for $\delta|_G \in \Delta^*$. Formulae of the form $K_i \varphi$ mean that the agent i knows that φ while $[\delta|_G]\varphi$ means that φ holds after every possible outcome of $\delta|_G$.

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Paraconsistency: Introduction I

Priest gives the following simple example (Priest, 2006).

I contract with party X to be present at a certain spot at a certain time. Separately, I contract with party Y not to be present at that spot at that time. Both contracts are validated in the usual way, by witnessing, etc. I may do this with or without ill intention. It may be my intention to deceive one of the parties. On the other hand, I may just be absent- minded. In such circumstances I am legally obliged both to be and not to be at this spot at this time. (...)



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Paraconsistency: Introduction II

How can one be sure that I am committed to inconsistent obligations in the situation described? The answer is simple. If, after the event, I am sued by the party of whichever contract I do not comply with, the court will hold me in breach of obligation and award damages appropriately. Having committed myself to do something different is no defence.



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Paraconsistency: Formalism I

Before defining the semantics of O modality, we need to distinguish extensions $\omega^+(w)$ and anti-extensions $\omega^-(w)$ of each state w. Extensions will contain "all those sentences of which obligatoriness may be truly predicated" while anti-extensions will contain "all those sentences of which it may be falsely predicated" at respective states [ibid]. Extensions and anti-extensions are not required to be exclusive, but they are required to be exhaustive. For a detailed treatment of extensions and anti-extensions and their further properties, we refer the reader to the aforementioned reference.



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Paraconsistency: Formalism II

Priest's deontic model is a 6-tuple $\langle G, W, R, \omega^+, \omega^-, V \rangle$ where $\langle W, R, V \rangle$ is a standard modal model, G is a designated element of W called "real world" and ω^+ and ω^- are functions from W returning sets of formulae. As we assumed them to be exhaustive, at any state w, $\omega^+(w)$ and $\omega^-(w)$ exhaust the set of formulae. Now, we say that the formula $O\varphi$ is true at w if and only if $\varphi \in \omega^+(w)$, and moreover $O\varphi$ is false at w if and only if $\varphi \in \omega^-(w)$ [ibid].



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Deontic Interpreted Systems I

In their relatively recent work Lomuscio and Sergot present a deontic extension of interpreted systems (Lomuscio & Sergot, 2003). This system was originally defined in (Halpern & Moses, 1990). So-called *Deontic Interpreted Systems* are developed to provide a grounded semantics for the deontic notions of *ideal functioning behavior* of an agent, the *knowledge that an agent is permitted to have*, and that of the knowledge an agent *has on the assumption that the components of the system are functioning correctly according to their protocols*.



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Deontic Interpreted Systems II

The main tool used to formalize these concepts are local and global states of violation and compliance. The notion of a local state in standard interpreted systems is used to represent the information available to the agent. In *deontic* interpreted systems, the set of local states is divided into allowed or correct (green) and disallowed or incorrect (red) states for each agent. Global states are tuples of local states for each agent. The framework of deontic interpreted systems is a Kripke model with global states as worlds.



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Deontic Interpreted Systems III

Agent-specific accessibility relations relate two worlds if the reached world is green for the agent in question. In this framework truth of $O_i\varphi$ at a global state means that φ is true in all the global states in which *i* is in a green state. Intuitively, φ is the case in all the possible correctly functioning alternatives of agent *i*. A sound and complete axiomatization for deontic interpreted systems in provided.



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Security I

In a 1992 paper, Glasgow et al. develop a framework to "specify and reason about security policies and to verify that system adheres to such policies". which introduces epistemic, temporal and deontic modalities in an interactive fashion (Glasgow *et al.*, 1992). They showed how the notions of secrecy and integrity can be expressed as safety and liveness properties respectively.



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Security II

Based on a branching temporal logic, they define the temporal and epistemic modalities in the usual sense. The way the epistemic and deontic relations are defined is worth mentioning. The epistemic indistinguishability relation R they utilize is related with the *observation*, i.e. external, point of view in the sense that the observer cannot distinguish the states at a given fixed time. Deontic relation R', on the other hand, is related with the *right to observe* at a given fixed time, hence what the observer is permitted to observe. We will represent their epistemic and deontic modalities with K_i and P_i respectively for an agent *i*.



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Applications				

Security III

Therefore, at the state w at time t, they define the semantics of such operators as usual, referring to their respective accessibility relation. This, $M, w, t \models K_i \varphi$ means that for all v such that $(w, v) \in R$, we have $M, v, t \models \varphi$. Similarly, $M, w, t \models P_i \varphi$ means that for all v such that $(w, v) \in R'$, we have $M, v, t \models \varphi$. As we remarked already, temporal operators are defined in the usual sense varying the t component of the tuple.



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We haven't discussed...

An interesting issue regarding the connection between morality and epistemology has been raised in the philosophical literature very widely. Epistemic Emotionism, traces our moral norms back to our emotions (Prinz, 2007). In other words "epistemic emotionists claim that there is a necessary connection between moral concepts and emotions", and therefore if this is the case "moral judgements" cannot occur without motivation" [ibid]. It is possible to take this stand further even if we do not focus on it very much. By the same token, it was claimed that epistemic norms are constituted with reference to our emotions. As we have seen in recent years, there is a strong tendency in the public to interpret current events in terms of their own prejudices, which may well have an emotional basis.

Epistemic Norms		Conclusion	
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Acknowledgements

We thank Jonathan Adler, Mark Alfano, and Paul McNamara for comments.



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Thanks!

Thanks for your attention!

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