

**09351 Abstracts Collection**  
**Information processing, rational belief change and**  
**social interaction**  
— **Dagstuhl Seminar** —

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**Abstract.** From 23.08. to 27.08.2009, the Dagstuhl Seminar 09351 “Information processing, rational belief change and social interaction” was held in Schloss Dagstuhl – Leibniz Center for Informatics. During the seminar, several participants presented their current research, and ongoing work and open problems were discussed. Abstracts of the presentations given during the seminar as well as abstracts of seminar results and ideas are put together in this paper. The first section describes the seminar topics and goals in general. Links to extended abstracts or full papers are provided, if available.

**Keywords.** Social software, belief revision, conditionals, social choice, game theory, contraction, update, argumentation, preference aggregation, agency, information

**09351 Executive Summary – Information processing,  
rational belief change and social interaction**

From August 23, 2009 to August 27, 2009, the Dagstuhl Seminar 09351 "Information processing, rational belief change and social interaction" was held at the International Conference and Research Center (IBFI), Schloss Dagstuhl. During the seminar, several participants presented their current research, and ongoing work and open problems were discussed.

Abstracts of the presentations given during the seminar as well as abstracts of seminar results and ideas are put together in these Proceedings. The Executive Summary describes the seminar topics and goals in general and contains the program of the workshop.

Links to extended abstracts or full papers are provided, if available.

*Keywords:* Social software, belief revision, conditionals, social choice, game theory, contraction, update, argumentation, preference aggregation, agency, information

*Joint work of:* Bonanno, Giacomo; Delgrande, James; Rott, Hans

*Full Paper:* <http://drops.dagstuhl.de/opus/volltexte/2009/2227>

## **BMS revisited**

*Guillaume Aucher (University of Luxembourg, LU)*

The insight of the BMS logical framework (proposed by Baltag, Moss and Solecki) is to represent how an event is perceived by several agents very similarly to the way one represents how a static situation is perceived by them: by means of a Kripke model. There are however some differences between the definitions of an epistemic model (representing the static situation) and an event model. In this paper we restore the symmetry.

The resulting logical framework allows to express statements about ongoing events and to model the fact that our perception of events (and not only of the static situation) can also be updated due to other events. We axiomatize it and prove its decidability. Finally, we show that it embeds the BMS one if we add common belief operators.

*Keywords:* Dynamic epistemic logic

*Full Paper:*

<http://aucher.gforge.uni.lu/TARK2009BIS.PDF>

*See also:* Guillaume Aucher: BMS revisited. TARK 2009: 24-33

## **The statics of rule update**

*Alexander Bochman (Holon Academic Inst. of Techn., IL)*

We argue that there is an essential difference between the dynamics of factual belief change and the process of rule update, so the traditional models of belief update are inappropriate for the latter. Instead, the process of rule update ought to be represented in a static framework of a prioritized system of rules. Some of the principal questions and problems arising under this view are discussed.

*Keywords:* Rule update, belief update, prioritisation, nonmonotonic reasoning

## **Revealed preference, iterated belief revision and dynamic games**

*Giacomo Bonanno (Univ. of California at Davis, US)*

In previous work (G. Bonanno, Rational choice and AGM belief revision, Artificial Intelligence, 2009) a semantics for AGM belief revision was proposed based on choice frames, borrowed from the rational choice literature.

In this paper we discuss how to use choice frames to analyze extensive-form games. Given an extensive form with perfect recall, a choice frame can be used to represent a player's initial beliefs and her disposition to change those beliefs when she is informed that it is her turn to move. When some players move more than once along some play of the game, the issue of iterated belief revision arises. We provide a semantics for iterated belief revision in terms of choice frames and provide an outline of how to use choice frames to analyze solution concepts for extensive-form games.

*Keywords:* Choice function, AGM belief revision, extensive-form game, iterated belief revision

*Full Paper:* <http://drops.dagstuhl.de/opus/volltexte/2009/2232>

## Argumentation Context Systems: A Framework for Abstract Group Argumentation

*Gerhard Brewka (Universität Leipzig, DE)*

We introduce a modular framework for distributed abstract argumentation where the argumentation context, that is information about preferences among arguments, values, validity, reasoning mode (skeptical vs. credulous) and even the chosen semantics can be explicitly represented. The framework consists of a collection of abstract argument systems connected via mediators. Each mediator integrates information coming from connected argument systems (thereby handling conflicts within this information) and provides the context used in a particular argumentation module. The framework can be used in different directions; e.g., for hierarchic argumentation as typically found in legal reasoning, or to model group argumentation processes.

*See also:* E. Erdem, F. Lin, and T. Schaub (Eds.): LPNMR 2009, LNCS 5753, pp. 44-57, 2009

## Deontic Epistemic stit Logic Distinguishing Modes of 'Mens Rea'

*Jan M. Broersen (Utrecht University, NL)*

Most juridical systems contain the principle that an act is only unlawful if the agent conducting the act has a 'guilty mind' ('mens rea'). Different law systems distinguish different modes of mens rea. For instance, American law distinguishes between 'knowingly' performing a criminal act, 'recklessness', 'strict liability', etc. I will show we can formalize several of these categories. The formalism I use is a complete stit-logic featuring operators for stit-actions taking effect in 'next' states, S5-knowledge operators and SDL-type obligation operators. The different modes of 'mens rea' correspond to the violation conditions of different types of obligation definable in the logic.

*Keywords:* Product update, agency, stit theory, knowingly doing

*Full Paper:* <http://drops.dagstuhl.de/opus/volltexte/2009/2229>

## **Interpreting Product Update as Reasoning about Observations and Meta-Observations**

*Jan M. Broersen (Utrecht University, NL)*

In this brief note, I would like to suggest that it makes sense to reinterpret product update, as introduced by Baltag, Moss and Solecki, as a system to account for observations and metaobservations, where a meta-observation is an observation of an observation. Under this interpretation we also take products of action models with meta-action models. I deliberate on some possible consequences of this extension to the interpretation of product update.

*Keywords:* Product update, agency, stit theory, knowingly doing

*Full Paper:* <http://drops.dagstuhl.de/opus/volltexte/2009/2233>

## **A semantics for conditional assertions**

*John Cantwell (KTH Stockholm, SE)*

I propose a semantics for conditionals based on a semantic version of the Ramsey Test:

"If A, then B" is true if and only if B is true on the assumption that A.

This presupposes a semantics for conditional assertions. The resulting logic is completely axiomatized revealing a logic with some interesting properties (e.g. the import-export rule is validated). I also show how the semantics explains some puzzling phenomena when modalities occur in the consequent of a conditional, and how seemingly inherently 'conditional' modalities, such as conditional probabilities and conditional obligations can be decomposed into a conditional component and a categorical component.

*Keywords:* Conditionals, conditional assertions, conditional probabilities, conditional obligations

## **Revising with Several Formulas**

*James Delgrande (Simon Fraser University - Burnaby, CA)*

A recalcitrant problem in approaches to iterated belief revision is that, after first revising by a formula and then by a formula that is inconsistent with the first formula, all information in the original formula is lost.

As noted by various researchers, this phenomenon is made explicit in the second postulate (C2) of the well-known Darwiche-Pearl framework, and so this postulate has been a point of criticism of this and related approaches.

In contrast, we argue that the true culprit of this problem arises from a basic assumption of the AGM framework, that new information is necessarily represented by a single formula. We propose a more general framework for belief revision (called parallel belief revision) in which individual items of new information are represented by a set of formulas. In this framework, if one revises by a set of formulas, and then by the negation of some members of this set, then other members of the set are still believed after the revision. Hence the aforesaid problem is discharged. We present first a basic approach to parallel belief revision, and next an approach that combines the basic approach with that of Jin and Thielscher. Postulates and semantic conditions characterizing these approaches are given, and representation results provided. We conclude by using the approach to re-examine basic assumptions underlying iterated belief revision.

## Meta-epistemic logic: A simple modal logic for reasoning about revealed beliefs

*Didier Dubois (Université Paul Sabatier (IRIT) - Toulouse, FR)*

Even though in Artificial Intelligence, a set of formulas in classical logic is often called a belief base, reasoning about beliefs requires more than the language of classical logic. This paper proposes a simple logic whose atoms are beliefs and formulas are conjunctions, disjunctions and negations of beliefs. It enables an agent to reason about some beliefs of another agent as revealed by the latter. This logic, called *MEL*, borrows its axioms from the modal logic *KD*, but it is an encapsulation of propositional logic rather than an extension thereof. *MEL* bears some closer formal connection with Pauly's consensus logic. Its semantics is in terms of subsets of interpretations, and the models of a formula in *MEL* is a family of subsets of interpretations. It captures the idea that if the epistemic state of an agent about the world is represented by a subset of possible worlds, the meta-epistemic state of another agent about the former's epistemic state is a family of such subsets. We prove that any family of subsets of interpretations can be expressed as a single formula in *MEL*. This formula is a symbolic counterpart of the Möbius transform in the theory of belief functions.

*Keywords:* Belief, incomplete information, epistemic state, modality, Moebius transform

*Joint work of:* Mohua, Banerjee; Dubois, Didier

## **Systematic judgment aggregators: An algebraic connection between social and logical structure**

*Daniel Eckert (Universität Graz, AT)*

We present several results that show that systematic (complete) judgment aggregators can be viewed as both (2-valued) Boolean homomorphisms and as syntactic versions of reduced (ultra)products. Thereby, Arrovian judgment aggregators link the Boolean algebraic structures of (i) the set of coalitions (ii) the agenda, and (iii) the set of truth values of collective judgments. Since filters arise naturally in the context of Boolean algebras, these findings provide an explanation for the extraordinary effectiveness of the filter method in abstract aggregation theory.

*Keywords:* Judgment aggregation, social structure, Boolean homomorphism, ultraproduct

*Joint work of:* Eckert, Daniel; Herzberg, Frederik

*Full Paper:* <http://drops.dagstuhl.de/opus/volltexte/2009/2230>

## **Speech acts as announcements**

*Andreas Herzig (Université Paul Sabatier (IRIT) - Toulouse, FR)*

Our aim is to use the logic of public announcements and more generally dynamic epistemic logics as a logic of speech acts. To that end we start from a simple multimodal logic of beliefs and goals (without common belief), and add public announcements. We suppose that announcements do not modify goals. We then consider several variants of speech acts of assertive and directive force and provide a modelling in terms of speech acts.

*Keywords:* Logic of belief, logic of goals, speech act theory, dynamic epistemic logic, public announcements

*Joint work of:* Guiraud, Nadine; Herzig, Andreas; Lorini, Emiliano

## **(Iterated) Revision and Update, Revisited**

*Gabriele Kern-Isberner (TU Dortmund, DE)*

In this talk, belief change is investigated within an abstract framework of epistemic states and sets of conditional beliefs.

This goes far beyond the well-known AGM or KM frameworks, but we argue that change operations in such rich epistemic frameworks allow for a more accurate view on belief change from which consequences for classical belief revision and update might be derived. In particular, our approach makes revision and update two different instances of a basic epistemic change operator which takes a prior epistemic state and a set of conditional beliefs as input and returns a posterior epistemic state. In this way, we shed light both on parallels and on differences between revision and update. Furthermore, we propose a (first) approach how to take knowledge on actions and observations into account as well that implements a close connection between actions and update, on the one hand, and observations and revision, on the other. We use a well-known example to illustrate that even in more complicated cases, proper results can be obtained quite easily.

*Keywords:* Belief revision, belief update, ordinal conditional functions, actions

## Improvement Operators

*Sebastien Konieczny (Université d'Artois - Lens, FR)*

We introduce a new class of change operators. They are a generalization of usual iterated belief revision operators. The idea is to relax the success property, so the new information is not necessarily believed after the improvement. But its plausibility has increased in the epistemic state. So, iterating the process sufficiently many times, the new information will be finally believed. We give syntactical and semantical characterizations of these operators.

*Keywords:* Belief Revision, Iteration

*Joint work of:* Konieczny, Sebastien; Pino-Perez, Ramon

## Preference change triggered by belief change: a principled approach

*Jerome Lang (CNRS - Paris, FR)*

Various tasks need to consider preferences in a dynamic way. To evaluate and classify methods for preference change, we introduce eight properties for preferences evolving after some new fact has been learned.

Four properties are concerned with persistence of preferences when something being preferred is (partly) satisfied or dissatisfied, and formalize that preference change indicates that the ideal state has not been reached or has become unreachable.

Four other properties are concerned with persistence of preferences when, roughly, the agent learns something she already expected to hold, and formalizes that preference change is due to surprise.

We define a family of preference change operators, parameterized by a revision function on epistemic states and a semantics for interpreting preferences over formulas, and we give conditions on the revision function and the semantics of preference for each of the eight conditions to hold.

*Joint work of:* Lang, Jerome; van der Torre, Leon

## **Epistemic Games in Modal Logic: Joint Actions, Knowledge and Preferences all together**

*Emiliano Lorini (Université Paul Sabatier (IRIT) - Toulouse, FR)*

We present in this work a sound and complete modal logic called EDLA (Epistemic Dynamic Logic of Agency) integrating the concepts of joint action, preference and knowledge and enabling to reason about epistemic games in strategic form. We provide complexity results for EDLA. In the second part of the paper, we study in EDLA the epistemic and rationality conditions of some classical solution concepts like Nash equilibrium and Iterated Deletion of Strictly Dominated Strategies (IDSDS). In the last part of the paper we combine EDLA with Dynamic Epistemic Logic (DEL) in order to model epistemic game dynamics.

*Keywords:* Modal logic, game theory, epistemic games

*Joint work of:* Lorini, Emiliano; Schwarzenruber, François; Herzig, Andreas

*Full Paper:* <http://drops.dagstuhl.de/opus/volltexte/2009/2231>

## **Next steps in propositional Horn contraction**

*Thomas Meyer (Meraka Institute - Pretoria, ZA)*

Standard belief contraction assumes an underlying logic containing full classical propositional logic, but there are good reasons for considering contraction in less expressive logics. In this paper we focus on Horn logic. In addition to being of interest in its own right, our choice is motivated by the use of Horn logic in several areas, including ontology reasoning in description logics. We consider three versions of contraction: entailment-based and inconsistency-based contraction (e-contraction and i-contraction, resp.), introduced by Delgrande for Horn logic, and package contraction (p-contraction), studied by Fuhrmann and Hansson for the classical case. We show that the standard basic form of contraction, partial meet, is too strong in the Horn case. We define more appropriate notions of basic contraction for all three types above, and provide associated representation results in terms of postulates. Our results stand in contrast to Delgrande's conjectures that orderly maxichoice is the appropriate contraction for both e- and i-contraction. Our interest in p-contraction stems from its relationship with an important reasoning task in ontological reasoning: repairing the subsumption hierarchy in EL. This is closely related to p-contraction with sets of basic Horn clauses. We show that this restricted version of p-contraction can also be represented as i-contraction.



*Keywords:* Belief contraction, Horn logic

*Joint work of:* Meyer, Thomas; Richard Booth, Ivan Varzinczak

*See also:* Richard Booth, Thomas Meyer and Ivan José Varzinczak. Next Steps in Propositional Horn Contraction. In Craig Boutilier ed., Proceedings of IJCAI 2009: Twenty-First International Joint Conference on Artificial Intelligence, 702-707, AAAI Press, 2009.

## Two Approaches to Iterated Belief Contraction

*Abhaya Nayak (Macquarie University - Sydney, AU)*

Iterated Belief Contraction is a relatively less explored area in belief change and intuition for it is often driven by work in the area of iterated belief revision. One of the influential approaches to iterated belief revision is natural revision propounded by Craig Boutilier. In a recent work a corresponding account of natural contraction was outlined by Nayak and his colleagues. Another approach to iterated contraction outlined in their work is Priority Contraction. In this work we show that both of these contraction functions satisfy the Principled Factored Insertion. Furthermore, we characterize them via some simple properties of iterated contraction.

*Keywords:* Iterated Belief Contraction, natural revision, factoring

*Joint work of:* Ramachandran, Raghav; Nayak, Abhaya; Orgun, Mehmet

## Belief in the Opponents' Future Rationality

*Andres Perea (Maastricht University, NL)*

In this paper we focus on dynamic games with almost perfect information, that is, at every stage some players (possibly one) make a choice simultaneously, and these choices become known to everyone before the next stage starts. We introduce the idea of common belief in future rationality, which states that a player always believes that his opponents will choose rationally in the present and in the future, that a player always believes that every opponent always believes that each of his opponents will choose rationally in the present and in the future, and so on. We present an easy elimination procedure, backwards dominance, that selects exactly those strategies that can rationally be chosen under common belief in future rationality. This procedure can be viewed as a combination of backwards induction and iterated strict dominance. We finally relate the concept to other rationality concepts in the literature.

*Keywords:* Epistemic game theory, dynamic games, belief in future rationality, algorithms

## Distances, structured profiles and Arrow's Theorem

*Ramon Pino-Perez (Univ. de Los Andes - Merida, VE)*

We study preferences which are structured by a distance  $d$ . With the help of  $d$ , many functions can be defined for which the input is a pair formed by an alternative and a set of alternatives. We shall call these functions "distances" between an alternative and a set of alternatives. The usual way to construct these distances is via an aggregation function. These distances allow the construction of structured preferences and then structured profiles.

We propose a natural condition on these distances called *richness property*, which allows us to prove Arrow's Theorem for the class of profiles structured by distances satisfying the condition. Then we study two distances  $d^{min}$  and  $d^\sigma$  when  $d$  is the Hamming distance. We prove that  $d^\sigma$  satisfies the richness property but  $d^{min}$  does not.

*Keywords:* Social Choice Theory, Arrow's Theorem, distances, structured profiles, aggregation functions

*Joint work of:* Pino-Perez, Ramon; Salcedo, Dubraska

## Similarity-based enlarging of statements for coping with inconsistency. Part 1: Motivations and general principle

*Henri Prade (Université Paul Sabatier (IRIT) - Toulouse, FR)*

The inconsistency between pieces of information provided by different sources, or by different agents, may be often due to uncertainty in meaning rather than to the presence of information that would be "really" false. Then it may appear more natural for restoring consistency to allow for a more permissive understanding of propositions rather than to ignore some propositions that would be less entrenched. The presentation, in two parts, discusses this idea.

Part 1. Motivations and general principle (Henri Prade and Steven Schockaert)

The fact that uncertainty in meaning, or if we prefer 'vagueness', is pervading social interaction has been recognized early in AI (by Wahlster and his co-workers). It may be even intentionally used in, e.g., bargaining dialogues. The presentation first briefly discusses the interest of similarity-based enlargements of propositions in approximate reasoning and in belief revision, before introducing the general principle on illustrative examples in information fusion.

Part 2. Merging multiple source information (Steven Schockaert and Henri Prade)

The talk discusses a new approach to merging conflicting propositional knowledge bases which builds on the idea that consistency can often be restored by interpreting propositions in a flexible way, thus enlarging their sets of models. We explore this idea first at the semantic level, contrasting different views, and

subsequently illustrate how a syntactic counterpart can be implemented using possibilistic logic.

*Joint work of:* Prade, Henri; Schockaert, Steven

## On the Semantics of Multiple Contraction

*Mauricio Reis (University of Madeira - Funchal, PT)*

We present the possible worlds semantics for multiple contraction and propose two new multiple contraction operations which generalize (to the multiple contraction case) the spheres' system-based (singleton) contraction (Grove 1988) and the epistemic entrenchment-based (singleton) contraction (Gärdenfors and Makinsson 1988).

*Joint work of:* Reis, Mauricio; Ferme, Eduardo

## The Ramsey Test for Conditionals and Iterated Theory Change

*Hans Rott (Univ. of Regensburg, DE)*

According to the Ramsey Test, conditionals reflect changes of beliefs:

$A > B$  is accepted in a belief state  $*D*$  iff  $B$  is accepted in the minimal revision of  $*D*$  necessary to accommodate  $A$ . More than 20 years ago, the Ramsey test came under heavy attack. A series of impossibility theorems ("triviality theorems") seemed to show that given standard models of theory change, the Ramsey test cannot serve as a viable analysis of conditionals. Other authors have come to its defence, arguing that it is rather the standard AGM-type model of theory change that is mistaken. In this talk I argue that an overly postulational approach to the semantics of (nested) conditionals should be avoided and that one should instead turn to an analysis in terms of constructive models of (iterated) theory change.

A crucial question is whether it is possible to use the Ramsey Test for the interpretation of conditionals and still respect the Preservation Condition according to which the original belief state  $*D*$  should be fully retained after a revision by information that is consistent with  $*D*$ . Among the four most natural qualitative models for iterated belief change, I identify two solutions that indeed allow us to combine the Ramsey test with Preservation in languages containing only non-nested conditionals of the form  $A > B$ . These solutions, however, violate Preservation for nested conditionals of the form  $A > (B > C)$ . I argue that by looking at the constructive models, we can understand why it has been wrong to expect that Preservation holds in languages containing nested conditionals.

## **How Mindless is Standard Economics Really?**

*Burkhard C. Schipper (Univ. of California at Davis, US)*

Very Preliminary: Contrary to claims by Gul and Pesendorfer (2008) "The Case for Mindless Economics" I show that standard economics makes use of non-choice evidence in a meaningful way. This is because standard economics solely grounded in the theory of choice is "incomplete" in the sense that it has content that can not be revealed with any effective choice procedure.

## **Prioritized and Non-prioritized Multiple Change on Belief Bases**

*Guillermo Simari (Universidad Nacional del Sur - Bahia Blanca, AR)*

In this article we explore multiple change operators, that is, operators in which the epistemic input is a set of sentences instead of a single sentence. We propose two types of change: prioritized change, in which the input set is fully accepted, and symmetric change, in which both the epistemic state and the epistemic input are equally treated. In both kinds of operators we propose a set of postulates and we present different constructions: kernel changes and partial meet changes.

*Keywords:* Belief Revision, Knowledge Dynamics, Multiple Change, Belief Bases.

*Joint work of:* Falappa, Marcelo; Kern-Isberner, Gabriele; Reis, Mauricio; Simari, Guillermo

## **Argument Theory Change Applied to Defeasible Logic Programming**

*Guillermo Simari (Universidad Nacional del Sur - Bahia Blanca, AR)*

In this article we work on certain aspects of the belief change theory in order to make them suitable for argumentation systems.

This approach is based on Defeasible Logic Programming as the argumentation formalism from which we ground the definitions. The objective of our proposal is to define an argument revision operator that inserts a new argument into a defeasible logic program in such a way that this argument ends up undefeated after the revision, thus warranting its conclusion.

In order to ensure this warrant, the defeasible logic program has to be changed in concordance with a minimal change principle. Finally, we present an algorithm that implements the argument revision operation.

*Keywords:* Belief Revision, Defeasible Logic Programming

*Joint work of:* Moguillansky, Martin; Rotstein, Nicolás; Falappa, Marcelo; Garcia, Alejandro; Simari, Guillermo

*See also:* Twenty- Third Conference on Artificial Intelligence, AAAI2008: 132-137, Chicago, Illinois, USA, July 2008.

## Awareness and forgetting of facts and agents

*Hans Van Ditmarsch (University of Sevilla, ES)*

We propose various logical semantics for change of awareness. The setting is that of multiple agents that may become aware of facts or other agents, or forget about them. We model these dynamics by quantifying over propositional variables and agent variables, in a multi-agent epistemic language with awareness operators, employing a notion of bisimulation with a clause for ‘same awareness’. The quantification is over all different ways in which an agent can become aware (or forget). Logics for change of awareness combine well with logics for informational change, as when a public announcement simultaneously makes you aware of an issue (‘a plane just crashed on Schiphol Airport’).

*Keywords:* Awareness, knowledge, multi-agent systems, dynamics

*Full Paper:* <http://drops.dagstuhl.de/opus/volltexte/2009/2228>

## Inclusion and Recovery in Belief Base Dynamics

*Renata Wassermann (University of Sao Paolo, BR)*

When contracting a formula from a belief base, two desiderata compete: one wants to avoid including any new belief in the process (inclusion) but may want to be able to recover information that was in the base before the contraction took place (recovery).

The AGM paradigm imposes both constraints on contraction operations. However, for finite belief bases inclusion and recovery cannot be simultaneously satisfied.

In this paper, we examine constructions that weaken the inclusion constraint and retain some form of recovery. We show that depending on what is allowed to be added, we obtain a counterpart to the principle of minimal change, where we add just enough information to allow recovery.

*Keywords:* Belief Revision, Rationality postulates

## Belief Revision with Bounded Treewidth

*Stefan Woltran (TU Wien, AT)*

Problems arising from the revision of propositional knowledge bases have been intensively studied for two decades.

Many different approaches to revision have thus been suggested, with the ones by Dalal or Satoh being two of the most fundamental ones. As is well known, most computational tasks in this area are intractable.

Therefore, in practical applications, one requires sufficient conditions under which revision problems become efficiently solvable.

In this talk, we present such tractable fragments exploiting the notion of treewidth. More specifically, we present a new algorithm based on dynamic programming for problems in Dalal's setting and a tractability proof using Courcelle's Theorem for Satoh's approach.

The paper has been published in the Proceedings of the 10th International Conference on Logic Programming and Nonmonotonic Reasoning (LPNMR'09), pp. 115-128, Springer LNAI 5753.

*Full Paper:*

[http://dx.doi.org/10.1007/978-3-642-04238-6\\_22](http://dx.doi.org/10.1007/978-3-642-04238-6_22)

## **Contracting norms**

*Leon van der Torre (University of Luxembourg, LU)*

AGM theory change was developed as a formal framework for norm change, but its restriction to propositional theories does not make it suitable for conditional norms. In this talk we discuss a framework for norm change, and we present some results for contraction of conditional norms.

*Keywords:* Normative systems, deontic logic, norm change

*Joint work of:* Boella, Guido; Pigozzi, Gabriella; van der Torre, Leendert