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# THE REASONER

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VOLUME 2, NUMBER 4  
APRIL 2008

[www.thereasoner.org](http://www.thereasoner.org)

ISSN 1757-0522

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## EDITORIAL

I was very happy to receive Jon's invitation to act as a Guest Editor and to have the opportunity to contribute to his extensive effort to make reasoning an interdisciplinary subject of investigation. This editorial and the following interview with Professor Frederick Schauer are focused on the nature of legal reasoning and its relation to reasoning in general.

Legal Reasoning is traditionally divided into two stages. In the first stage, the court determines the facts. It is this stage in which evidence is adduced, witnesses are cross examined, etc. In this stage, the legal fact-finder (either a judge or a jury, depending on the specific legal system) decides any factual disputes between the parties (i.e., disputes about *what happened*). In the second stage, the court extracts the relevant legal rules (from statutes and/or case law, depends on the area of law and the specific legal system) and applies them to the fact of the case. This is the stage in which the court determines the legal outcome, according to the facts as determined. Professor Schauer provides some illuminating insights into the nature of this latter stage. He emphasises interesting features of legal reasoning: the role of precedents and authorities in legal reasoning, and the tension between applying them and following one's own beliefs about what is right and just.

Legal reasoning is characterised by its institutional context, which creates a dual challenge. First, legal decisions have to be made under practical constraints of limited time, evidence and resources. This is of course not unique to the law, but the tension between the quality of the decision and the practical constraints is amplified by the need to reach a decision regardless of these constraints. After all, avoiding making any decision effectively amounts to a decision in favour of the defendant as it leaves the status quo intact. For example, the evidence available may not be sufficient to reach to a good decision. Yet, even if some desirable evidence is missing (e.g., the relevant science about certain factual question is not mature enough), the legal decision-maker must make a decision with the information she has. To that one may add that 'justice delayed is justice denied'. Not only might the legal decision maker suffer from lack of sufficient evidence, she has to reach a timely decision. Even if the decision could be improved by lengthier investigation, spending too much time on the decision means not only delay for the parties themselves, but also delay for litigants in other cases who wait for their day in court. The legal



system needs to constantly balance the quality of the decision making process and the practical constraints of time, evidence and resources.

The second dimension of the institutional challenge to the law arises from the expectation of consistency. Despite the fact that legal decisions are reached by numerous different individuals all over the country, the law is expected to be consistent and coherent. If you have a certain right which deserves to be vindicated by the law, you are entitled to expect the court to vindicate it regardless of the personal views of the individual judge who happens to hear your case, or the geographic region in which the problems arose (this determines the court in which your case will be heard). This expectation is higher than the one which drives the postcode lottery concern in healthcare. In healthcare, you may expect the same quality of treatment from the NHS regardless of the region you happen to live in. The expectation from the legal system is even higher: we expect not only the same quality of service, but also the same result—‘similar cases should be similarly decided’.

The practice of using precedents and authorities in legal decision making should be viewed in light of this dual institutional challenge as this challenge may shed some light on the motivation beyond the practice. Yet, as Professor Schauer’s answers explain, not only does the use of precedents and authorities raise important theoretical and practical questions, it also leads to some interesting and sometimes counter intuitive consequences.

Amit Pundik  
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## §2

### FEATURES

#### **Interview with Frederick Schauer**

**Frederick Schauer** is Frank Stanton Professor of the First Amendment at the John F. Kennedy School of Government, Harvard University. He teaches courses in Evidence and the First Amendment and supervises graduate students in Jurisprudence and Comparative Constitutional Law at the Harvard Law School. Schauer’s work in jurisprudence focuses on the analysis of rules and the nature of legal sources. Among his books is *Playing By the Rules: A Philosophical Examination of Rule-Based Decision-Making in Law and in Life* (Clarendon, 1991). He also works on constitutional law and human rights on freedom of expression and constitutional

interpretation. Schauer is currently completing a book (2008: *Thinking Like a Lawyer: A New Introduction to Legal Reasoning*, Harvard) on the forms of legal reasoning and argument. In 2007–2008 Schauer is the George Eastman Visiting Professor at Oxford University and a Fellow of Balliol College.

Amit Pundik: How would you describe ‘legal reasoning’ to a non-legal audience?

Frederick Schauer: Legal reasoning is part of what judges do when they decide cases, and thus part of what lawyers do when they argue cases in front of judges. It is not all of what lawyers and judges do, or even all of how lawyers and judges think. In many respects, lawyers and judges think and reason like everyone else, and sometimes they do it well and sometimes poorly. But there are some particular forms of thinking and reasoning that, although found outside the legal system, are especially concentrated in law. These include decision according to precedent, in which the fact that something has been decided before is a good reason (and maybe a conclusive reason) for deciding the same thing the same way; decision according to rules, where the question is not what the right decision is, but what a rule requires; heavy reliance on authority, where taking what an authoritative source said is more important than the independent judgment of the judge; and a concern with jurisdiction, where what is important is not only what the decision is, but also who has the authority to make it.



AP: In what aspects, if any, does legal reasoning differ from any other kind of reasoning?

FS: What is important about decision-making according to precedent, rules, and authority, and a concern with jurisdiction, is that all of these devices may at times take the decision-maker away from what she thinks is the best all-things-considered decision. When what a rule or precedent or authority says is consistent with what the judge would otherwise have done, there is no problem. But when a rule or precedent or authority commands a judge to do what she thinks is wrong, law will dictate to the judge that the judge make the wrong decision. Indeed, it is interesting that following a precedent is described in many introductory books on logic as a fallacy. That law, in the service of long term Rule of Law values, often tells its decision-makers to do what they think is wrong or fallacious, and is the most noteworthy feature of legal reasoning. To repeat, this is not totally unique to law. But this general approach is more concentrated in law than elsewhere, partly because of the values of stability, predictability, constraint on discretion, and settlement for settlement’s sake that are

the special province of the law, but which are not necessarily best for all decision-making systems at all times.

AP: What role do you think normative and moral considerations have in legal reasoning?

FS: Not very much in legal reasoning, but a great deal in law. When judges decide according to rule or precedent, they are instructed to follow the rule instead of doing the morally or politically or practically right thing. Why this is so is itself a normative or moral issue, but there can be good moral reasons for not wanting every decision-maker to make what he believes, possibly mistakenly, to be the best moral decision. Just as John Stuart Mill in *Utilitarianism* argued that we achieve the greatest utility if people do not try to maximize utility in every case, so too is the idea of the Rule of Law premised, in part, on the fact that we may get the greatest number of morally good results if every judge and bureaucrat and police officer is not encouraged—or even allowed—to try to do the morally best thing in each case.

There are two important exceptions to this. One is the so-called gap. When the law is unclear or silent, making decisions that are driven by normative and moral considerations is inevitable. To take an example from the American Constitution, it would be impossible to decide what ‘equal protection of the laws’ in the Fourteenth Amendment meant without considering the moral dimensions of equality. And when laws conflict, or say nothing at all, the full range of non-legal considerations—including morality—comes into play.

In addition, legal rules (and precedent and authority) are best seen as presumptive rather than necessarily conclusive. When the law appears to command that which is deeply or gravely (and not just somewhat or considerably) wrong, most legal systems properly allow their decision-makers to depart from what the law appears on the surface to require in the name of equity, or justice, and that is as it should be. But the presumption is important. It is not that equity or justice come into play in every case. They are for the cases of exceptional injustice.

AP: When it comes to reasoning, do you think lawyers have something to learn from other disciplines, such as philosophy and statistics?

FS: Yes, in part because of the skills of thinking and analysis in general that such disciplines teach. And in part because legal argument, especially in appellate courts, takes place at the fuzzy edges of the law—Hart called them penumbras—where non-legal considerations loom especially large.

AP: Do you think legal reasoning makes any contribution to the general philosophical questions about reasoning?

FS: Yes, because the characteristic devices of legal reasoning do occur outside

of law. So philosophers who are interested in rule-consequentialism have much to learn from how the law thinks about rules. And philosophical questions about authority—central to much of political philosophy—can learn from the analysis of authority in legal systems.

## Winnowing Out Liars ... And Others

In “When is a statement not a statement?—When it’s a Liar” (2008: *The Reasoner* 2:2, pp. 4-6) Laurence Goldstein and Alex Blum argue that Liars fail to say anything (either true or false). They are right. Liar sentences *are* meaningless; they cannot express proposition. But *why* do Liars say nothing?

In (1975: “Outline of a Theory of Truth,” *Journal of Philosophy*, 72, pp. 690-716) Saul Kripke noted that we sometimes say things that are not paradoxical on the surface but turn out to be so under certain circumstances. He gives an example (pp. 54-55). The sentence (1) ‘Most (i.e., a majority) of Nixon’s assertions about Watergate are false’. No problem so far. Now suppose Nixon’s assertions about Watergate are evenly balanced between truths and falsities—except for (2) ‘Everything Jones says about Watergate is true’, where Jones’ only assertion about Watergate was (1). Under these circumstances both sentences would be paradoxical (true if and only if false). Saying something about what has been said can be, says Kripke, “risky;” it can have unintentional, unforeseen paradoxical consequences. Here is the lesson he draws:

... it would be fruitless to look for an *intrinsic* criterion that will enable us to sieve out—as meaningless, or ill-formed—those sentences which lead to paradox ... The moral: an adequate theory must allow our statements involving notions of truth to be *risky*: they risk being paradoxical if the empirical facts are extremely (and unexpectedly) unfavorable. There can be no syntactic or semantic “sieve” that will winnow out the “bad” cases while preserving the “good” ones. (p. 55)

He is doubly wrong here. The *risk* to our statements is not due only to our use of truth predicates, and ordinary language does have a *sieve* for winnowing out hidden paradox (see my 2006: *Bare Facts and Naked Truths*, Ashgate, chapter 6; the ideas involved originated with Fred Sommers).

We can use a sentence, among other things, to make a statement (express a proposition that we implicitly claim to be true). Sometimes it expresses a proposition about a sentence (‘His sentence is English’). But we can also make a statement

about a proposition ('What he said was news to me'). Also, a statement can be about the sentence being used to make that statement ('This sentence is English'). Finally, we can make a statement about the very proposition being expressed ('What I am now saying is true'). Call statements about propositions *comments*. When I say 'What he said is news to me' I make a comment about the proposition he expressed. When I say 'What I am now saying is true' I make a comment about the proposition I am expressing in making that comment.

We can get into trouble making comments about other propositions (i.e., propositions other than the one being expressed by the comment itself). And we always get into trouble by making comments about the propositions we are expressing in making such comments. Those are "risky" situations: the first kind was illustrated by Kripke's Nixon-Jones example, the second by Liars. The source of the trouble is the failure to adhere to a principle intrinsic in ordinary language, the application of which constitutes the "sieve."

Consider the statement (made by the appropriate use of the sentence) p.

p: Pluto is a planet

It is about Pluto (and perhaps planets in general) and says nothing about any sentence and is not a comment (on any proposition). It *expresses* the proposition *that Pluto is a planet*. '[Pluto is a planet]' or '[p]' are names of the proposition expressed by p. Now consider

q: It is doubtful that Pluto is a planet

q comments on [p]. We formulate it as

q.1: [p] is doubtful

Notice that q also expresses a proposition (and it is not the one on which it comments). It's the proposition *that it is doubtful that Pluto is a planet*. So, the proposition expressed by q is [[p] is doubtful]. A speaker might respond to q by using

r: That's not true

Here r comments on [q], which itself comments on [p]. We formulate r as

r.1: [q] is not true

which, when [q] is analysed, becomes

r.2: [[p] is doubtful] is not true

Notice how [p] continues to be embedded ever more deeply within new levels of commentary. We can thus refer to the *propositional depth* of any statement in terms of how many levels of comment it enfolds. Hence, p (like any non-comment) has a propositional depth of 0; q has a depth of 1; r has a depth of 2. Theoretically there is no limit to the depths that comments can reach. However, in “risky” situations either two statements make comments about each other (Nixon-Jones) or a single statement comments on itself (Liars). Let a and b be statements that comment on each other. It follows that a will have the form ‘[b]...’, while b will have the form ‘[a]...’. If the depth of a is n, then the depth of b must be n+1. But the depth of a then will have to be n+2, etc.! Consider the Liar, L. L has the form ‘[L]...’. It follows that whatever its propositional depth it will also have to be one more than that depth!

Risky statements alone, whether directly or indirectly self-referential, have the property that we can never succeed in determining exactly what their propositional depths are. Consequently, our “sieve”: *Every meaningful statement, can be assigned a determinate propositional depth.*

Recall that I said that it is wrong to attribute risk to our use of truth predicates. Their uses *can* be risky. But, as we’ve seen, the same holds for *any* semantic predicate used in commenting. Thus ‘surprising’ and ‘news to me’ might be deployed in ways leading to indeterminable propositional depth. Fortunately there is a natural sieve for winnowing out such cases.

George Englebretsen

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## Is All Abstracting Idealizing?

Steffen Ducheyne (2007: ‘Abstraction vs. Idealization’, *The Reasoner* 1(5):9–10) proposes the following definitions of abstracting and idealizing:

**ABSTRACTING:** We *abstract* from property *P* of a physical system *x* iff: in our corresponding scientific model, *P* is not included.

**IDEALIZING:** We *idealize* a property *P* of a physical system *x* iff: in our corresponding model, *P* is not included and *P* is replaced by a different property *Q* which is not exhibited by *x*.



(These definitions omit Ducheyne's symbolism but otherwise follow his wording.) According to Ducheyne's definitions, there is a difference between a model for a planet not including the planet's actual temperature and the model including an incorrect temperature: one obtains the former model by merely abstracting from the planet's actual temperature, whereas one obtains the latter by idealizing the planet's temperature.

Whether Ducheyne understands properties as physical parameters or physical quantities is unclear. (Following Frederick Suppe (1989: *The Semantic Conception of Theories and Scientific Realism* Chicago: University of Illinois Press, p.93), physical parameters are '*kinds of attributes* which certain particulars may possess'—such as mass and temperature—whereas physical quantities are amounts of certain physical parameters—such as 260 grams.) Accordingly, I stipulate that Ducheyne's definitions refer to properties in the sense of physical quantities and, perhaps, their negations—such as not-260 grams. (The added disjunct is important for not settling by fiat an issue that I raise below.) This seems to agree with the ordinary usage of 'idealizing.' And it entails that abstracting in *Ducheyne's sense* need not involve omitting a physical parameter from a model.

As Ducheyne notes, his definitions entail that every instance of idealizing a system's property is an instance of abstracting from that property. Hence, there is a significant distinction between abstracting and idealizing only if some instances of abstracting from a property are not instances of idealizing that property. The following argument shows that this is so only if omitting a property from a model need not involve including the contradictory of that property in that model. (For any property  $P$ , I call not- $P$  the contradictory of  $P$ .)

- 1: Suppose that there is a property  $P$  of a physical system  $x$  and that abstracting from  $P$  does not involve idealizing  $P$ .
- 2: No physical system has both the property  $P$  and the property not- $P$ .
- 3: Hence,  $x$  does not have the property not- $P$ . [1–2]
- 4: Suppose, for reductio, that if a model  $M(x)$  of physical system  $x$  does not include the property  $P$ , then  $M(x)$  includes the property not- $P$ .
- 5: If one abstracts from the property  $P$  of  $x$ , the resultant model  $M(x)$  does not include the property  $P$ . [Abstracting]
- 6: Hence, if one abstracts from property  $P$  of  $x$ , the resultant model  $M(x)$  includes a property that  $x$  does not have. [3–5]

7: Thus, if one abstracts from property  $P$  of  $x$ , one idealizes property  $P$  of  $x$ . [6, Idealizing]

8: Therefore, it is not the case that a model  $M(x)$  of physical system  $x$  includes the property not- $P$  if it does not include the property  $P$ . [1, 2, 4, 7]

This argument relies upon the assumption that for any property  $P$ , no physical system has both the property  $P$  and the property not- $P$ . This is nearly irreproachable. For it is true unless some contradictions are true of physical systems.

Since it is unclear whether there are true contradictions and less clear whether, if there are, some contradictions are true of the systems that scientists investigate, denying the above assumption is implausible. Accordingly, I assume that the significance of the distinction between abstracting and idealizing does not depend upon some contradictions being true of some physical systems. Hence, some instances of abstracting are not instances of idealizing (as assumed in the argument's initial premise) only if the following assumption is false:

**ABSENCES ENTAIL PROPERTIES:** For any property  $P$ , any model that does not include the property  $P$  includes the property not- $P$ .

If true, this assumption guarantees that a model of a physical system does not include a property of that system only if the model includes the contradictory of the omitted property. For example, it guarantees that if a model of an object with a temperature of 300 Kelvin does not include the object's actual temperature, it thereby includes the property of being not 300 Kelvin.

Ordinary ways of speaking seem to support *Absences Entail Properties*. Compare, for instance, the claim that a cat does not have a full-length tail and the claim that the cat has a tail that is not full-length. (To make the similarity more pronounced, compare the claim that a cat is not black with the claim that the cat is not-black.) These seem to have the same content: both seem to attribute the property of having a non-full-length tail to a cat. But they need not have the same content. For if 'The cat does not have a full-length tail' characterizes a model obtained by abstracting from the actual length of a cat's tail, this claim's content is that the cat's tail lacks the property of being full-length; and if *Absences Entail Properties* is false, this need not entail that the cat's tail also has the property of being not full-length. Accordingly, one should expect that if there is a significant difference between abstracting and idealizing, it is one that ordinary ways of speaking easily can obscure.

Against ordinary ways of speaking, some metaphysical accounts of properties seem to refute *Absences Entail Properties*. For example, according to David Armstrong (1978: *A Theory of Universals*, Cambridge: Cambridge University Press, pp.19–29), a property is whatever plays some sort of causal role (or would play a causal role in the right circumstances), and this entails that there are no negative properties. (The putative property of being not white is a paradigm instance of a negative property.) If Armstrong is correct, a model that lacks the property *P* does not thereby have the property not-*P*, because being not-*P* is not a property.

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## Questioning Idealism

Idealism is the view that everything is constituted of perceptions: the properties of the external world are wholly dependent on an observer's perceptions. In this sense, idealism is the view whose essence is captured by the famous Berkeleyan aphorism 'esse est percipi': to be is to be perceived.

The standard objection to idealism goes like this: 'If you bring an egg to the boil, then leave the kitchen for 3.5 minutes, you get a soft-boiled egg whether you are watching it or not', as Max Velmans puts it (2000: *Understanding Consciousness*, Routledge, London, 28). Call this the egg-argument. Although the expressed intuition seems to be strong, I would like to refresh an argument which provides a much stronger case against idealism. It is an argument from Sir Winston Churchill about which Sir Karl Popper stated that nobody mentions it. But after Popper had refreshed it in 1972, it nowadays seems that the philosophical community has forgotten it for a second time. Churchill claims that

“happily there is a method, apart altogether from our physical senses, of testing the reality of the sun . . . astronomers . . . predict by [mathematics and] pure reason that a black spot will pass across the sun on a certain day. You . . . look, and your sense of the sight immediately tells you that their calculations are vindicated . . . *We have taken what is called in military map-making 'a cross bearing'*. We have got *independent testimony* to the reality of the sun. *When my metaphysical friends tell me that the data on which the astronomers made their calculations were necessarily obtained originally through the evidence of their senses, I say 'No'. They might, in theory at any rate, be obtained by automatic*

*calculating-machines set in motion by the light falling upon them without admixture of the human senses at any stage*” (quoted from Popper 1972: ‘Two faces of common sense: an argument for commonsense realism and against the commonsense theory of knowledge’, *Objective Knowledge: An Evolutionary Approach* (revised edition), Oxford University Press, Oxford 1979, 32-105, here 43)

Let  $p$  be my mental world (the ‘percipi’) and let  $q$  be the external physical world (the ‘esse’). That is, my conscious perceptions of the egg and the sun are  $p$ , the concrete egg and the sun outside my skull are  $q$ . Idealism claims that  $q$  is wholly dependent on  $p$ , i.e., the egg and the sun are products of my mental world. The egg-argument argues that my perception  $p$  shows that the external world  $q$  is independent from  $p$ : The egg is boiled ( $= q$ ) ‘whether I am watching it or not’ ( $= p$ ). Although intuitively right, the egg-argument does not provide a proof:  $q$  may be wholly dependent on  $p$ . It *could* be the case that  $q$  does not occur without  $p$ . That is, the egg is boiled ( $q$ ) if and only if someone is perceiving it as boiled ( $p$ ). So when you leave the kitchen and do not perceive the egg nothing happens.

The sun-argument emphasises that  $q$  is independent from  $p$ : Whereas in the egg-argument  $q$  may depend on  $p$ , because both,  $q$  and  $p$ , appear *at the same moment* (time  $t_1$ ), the sun-argument provides a case where  $q$  is independent from  $p$ . Whereas  $p$  appears at time  $t_1$ ,  $q$  occurs at time  $t_2$ . It is a prediction at time  $t_1$  that  $q$  will occur at time  $t_2$ . Thus, my perception and prediction  $p$  (my mental world) and  $q$  (the external physical world) are in this respect independent. Furthermore,  $p$  is not necessary for  $q$  to occur: A machine can make the calculations and predictions about  $q$ —without my mental world ( $p$ ). So if there were no human beings in the whole universe (or other creatures which perceive the external world), then there is nevertheless an external world: The machine would have predicted that  $q$ , ‘whether we are watching it or not’. Although the whole external universe may still be a big dream or matrix, the sun-argument at least shows that  $p$  and  $q$  can occur independently of each other. Thus, there can be an ‘esse’ without a ‘percipi’.

Patrick Spät

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## Science and Pseudoscience, 15 March

This year the Birmingham Branch of the Royal Institute of Philosophy organized two events on the theme of [science and pseudoscience](#). Both events were aimed at the general public and were extremely well-attended.

The first event was a lecture by Professor John Dupré (Exeter) entitled: ‘Can a Pluralist tell Science from Pseudoscience?’ where he argued that the distinction between science and pseudoscience is an important distinction to make, pragmatically, but that there is no unified account of what counts as a science that can apply to all scientific enterprises. On the contrary, there are epistemic values that can be invoked in the assessment of any research project worth promoting.

The second event was co-sponsored by the British Society for the Philosophy of Science. It was an interdisciplinary one-day conference on how to tell science apart from pseudoscience. The audience included academics from philosophy, biology and psychology and psychiatry in the UK and Europe; undergraduate and graduate students in philosophy and science studies from the UK; and teachers and sixth formers from local schools. Main speakers were Professor Chris French (Psychology, Goldsmith); Professor Steve Fuller (Sociology, Warwick) and Professor John Worrall (Philosophy, London School of Economics). Respondents were Dr Philip Goff and Dr Darragh Byrne (Philosophy, University of Birmingham), and Dr Michela Massimi (Science and Technology Studies, University College London).

The issues discussed were: (1) whether parapsychology is a pseudoscience; (2) what the purpose of providing a demarcation criterion between science and pseudoscience is; and (3) how to react to the Intelligent Design debate. The discussion was very lively as different views were being presented by the main speakers. Professor Chris French, a skeptic about the existence of paranormal forces, argued nonetheless that parapsychology should not be regarded as a pseudoscience. He claimed that parapsychology seems to score as well as, if not better than, paradigmatic sciences such as physics on a range of criteria for science provided by influential accounts of the demarcation problem. Professor Fuller challenged the role of philosophers in the debate on demarcation and argued that they should not simply add a normative gloss to whatever scientists happen to do but rather engage in the normative exercise of establishing what science ought to be like (in this sense, he saw himself as a follower of Popper). Professor John Worrall discussed the shape the Intelligent Design

debate took in the US and observed how decisions about whether Intelligent Design was to be taught in school on a par with the theory of evolution relied on the criterion of testability. This criterion was used too crudely by the US judges but, according to Professor Worrall, it is important for marking the difference between Intelligent Design and the theory of evolution. The latter can be supported by evidence when combined with relevant auxiliary hypotheses (e.g. Kettlewell's moths).

In the panel discussion some time was spent clarifying what intelligent design actually claims, and whether defenders of evolution can avail themselves of the notion of 'design'. Professor French's argument for considering parapsychology as a legitimate scientific enterprise (with largely negative results) was also challenged by members of the audience.

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## **Constraint Satisfaction and Programming, 19 March**

Four papers and one poster were finally accepted at the Constraint Satisfaction and Programming Track at Symposium of Applied Computing (SAC'08). The topics involved different and important issues for the scientific community: new formal languages, models, problems and algorithms were proposed in Fortaleza (Brasil) in order to represent and solve complex problems by using constraint-based techniques.

Following the order of talks at the conference, the first paper (whose title is *Universal Concurrent Constraint Programming: Symbolic Semantics and Applications to Security*) introduced the Universal Timed Concurrent Constraint Programming (utcc) process calculus, which is a generalization of Timed Concurrent Constraint Programming. The language allows for the specification of mobile behaviours in the sense of Milner's pi-calculus: generation and communication of private channels or links. The language is presented with its operational semantics and then with a symbolic semantics, whose novelty is to use temporal constraints to represent finitely infinitely-many substitutions.

In the second paper (*Modeling Adversary Scheduling with QCSP+*), cumulative scheduling problems are conducted in the presence of an adversary. In such a setting the scheduler tries to manage the available resources so as to meet the scheduling deadline, while the adversary is allowed to change some parameters, like the resource consumption of some tasks. A robust schedule can be found, i.e., one that is guaranteed to work whatever (malicious) actions the opponent may take. The

authors propose to model this family of decision problems using a variant of Quantified Constraint Satisfaction Problems called QCSP+, and to solve them by using the solver QeCode.

The third paper (*An Efficient Algorithm for a Sharp Approximation of Universally Quantified Inequalities*) presents a new algorithm for solving a subclass of quantified constraint satisfaction problems (QCSP) where existential quantifiers precede universally quantified inequalities on continuous domains. This class of problems has numerous applications in engineering and design. A new generic branch and prune algorithm is proposed, where standard pruning operators and solution identification operators are specialized for universally quantified inequalities.

The fourth and last paper of the constraint track (*Splitting Heuristics for Disjunctive Numerical Constraints*) explores the potential of splitting heuristics that exploit the logical structure of disjunctive numerical constraint problems in order to simplify the problem along the search. The first experiments on formulas in conjunctive normal form show that interesting solving time gains can be achieved by choosing the right splitting points.

Finally, in the poster *Nested Temporal Networks with Alternatives: Recognition and Tractability* the authors study a tractable subclass of Temporal Networks with Alternatives in order to cover a wider range of real-life processes. This kind of networks are proposed in literature to model alternative and parallel processes in planning and scheduling applications. While the problem of deciding which nodes can be consistently included in such networks is NP-complete, the corresponding problem for this subset of networks can be instead solved in polynomial time. Moreover, the paper describes an algorithm that can effectively recognize whether a given network belongs to the proposed sub-class.

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## Calls for Papers

**INFORMATION FUSION:** Information Fusion in Public Health Informatics and Surveillance, special issue of Information Fusion, deadline 30 May.

**CONDITIONALS AND RANKING FUNCTIONS:** Special issue of *Erkenntnis*, franz.huber@uni-konstanz.de, deadline 31 May.

**APPLICATIONS AND METHODOLOGIES FOR PLANNING AND SCHEDULING:** Special issue of *Journal of Scheduling*, deadline 15 June.

**CAUSALITY AND PROBABILITY IN THE SCIENCES**

Deadline 1 July

**PROBABILISTIC MODELS FOR IMAGE UNDERSTANDING:** Special Issue of the *International Journal of Computer Vision*, deadline 21 July.

**KYBURG:** Special issue of *Synthese* commemorating Henry E. Kyburg, Jr, deadline 30 July.

**PROBABILISTIC GRAPHICAL MODELS IN COMPUTER VISION:** Special issue of *IEEE Transactions on Pattern Analysis and Machine Intelligence*, deadline 16 August.

**DEPENDENCE ISSUES IN KNOWLEDGE-BASED SYSTEMS:** Special Issue of *International Journal of Approximate Reasoning*, deadline 15 September.

## §4

### INTRODUCING ...

In this section we introduce a selection of key terms, texts and authors connected with reasoning. Entries will be collected in a volume *Key Terms in Logic*, to be published by Continuum. If you would like to contribute, please [click here](#) for more information. If you have feedback concerning any of the items printed here, please email [thereasoner@kent.ac.uk](mailto:thereasoner@kent.ac.uk) with your comments.

## Induction

Induction is the form of reasoning where a thinker's premises provide her with good, yet not conclusive, reasons to believe her conclusions. Having tasted lots of lemons I conclude that all lemons are bitter. I have good reason to think this, but this conclusion does not necessarily follow from the limited evidence that I have; the premises could be true and the conclusion false. Induction leads to conclusions that are likely to be true, or that are probably true, rather than to ones that are certainly true. Such reasoning aims to extend our knowledge: the content of inductive conclusions goes beyond the content of the relevant premises. A claim is made about all lemons from my experience of only some lemons. Induction can therefore involve arguments of



different strengths: if I taste a million bitter lemons I have more reason to think that they are all bitter than if I taste only ten. Such reasoning is contrasted with deduction: this involves the drawing of conclusions that must be true if the premises are true; deductive conclusions are certain, not probable. Induction used to refer only to induction by enumeration, but the term now covers a wider range of non-deductive inferences.

Dan O'Brien

Philosophy, Birmingham

## Abduction

Abduction is a nonmonotonic pattern of reasoning involved both in hypothesis formulation and explanation. While deduction determines necessary consequences and induction determines probable ones, abductive reasoning determines what plausible hypothesis would make sense of an already observed consequence. Abduction is also referred to as inference to the best explanation, i.e., concluding that one explanation is true from the fact that it provides a better explanation than any other. Although it is defeasible (compelling but not deductively valid), abduction has an important role in scientific discovery and artificial intelligence.

Benoit Hardy-Vallée

Philosophy, Toronto

§5

## EVENTS

APRIL

**AISB:** Artificial Intelligence and Simulation of Behaviour, Aberdeen, 1–4 April.

**SUBJECTIVE BAYESIAN METHODS:** Department of Probability and Statistics, University of Sheffield, 2 April.

**LSIR:** Logic and the Simulation of Interaction and Reasoning, Aberdeen, 3–4 April.

**RELMiCS10-AKA5:** 10th International Conference on Relational Methods in Computer Science & 5th International Conference on Applications of Kleene Algebra, Frauenwörth, Germany, 7–11 April.

**REDUCTION, EMERGENCE AND PHYSICS:** Tilburg Center for Logic and Philosophy of Science, 9 April.

**REDUCTION AND THE SPECIAL SCIENCES:** Tilburg Center for Logic and Philosophy of Science, 10–12 April.

**THEORETICAL FRAMEWORKS:** Theoretical Frameworks and Empirical Underdetermination Workshop, University of Düsseldorf, 10–12 April.

**FLOPS:** Ninth International Symposium on Functional and Logic Programming, Ise, Japan, 14–16 April.

**WORKSHOP:** XVIII Inter-University Workshop on Philosophy and Cognitive Science, Madrid, [luis.fernandez@filos.ucm.es](mailto:luis.fernandez@filos.ucm.es), 22–24 April.

**PRACTICAL RATIONALITY:** Intentionality, Normativity and Reflexivity, University of Navarra, 23–25 April.

**NON-CLASSICAL LOGICS:** From Foundations to Applications, Centro di Ricerca Matematica Ennio de Giorgi, Pisa, Italy, 24–26 April.

**SDM:** 8th Siam International Conference on Data Mining, Hyatt Regency Hotel, Atlanta, Georgia, USA, 24–26 April.

**TRANSCENDENTAL PHILOSOPHY:** Transcendental Philosophy and Naturalism in Maths and Logic, London, 25 April.

## MAY

**SBIES:** Seminar on Bayesian Inference in Econometrics and Statistics, University of Chicago Graduate School of Business Gleacher Center, 2–3 May.

**TML:** Workshop on Teaching Machine Learning, Saint-Etienne, 5–7 May.

**PRAGMATISM AND NATURALISM:** Workshop, Tilburg Center for Logic and Philosophy of Science, 7–9 May.

**SIG16:** 3rd Biennial Meeting of the EARLI-Special Interest Group 16—Metacognition, Ioannina, Greece, 8–10 May.

**CLE, EBL & SLALM:** 30th Anniversary of the Centre for Logic, Epistemology and the History of Science (CLE), UNICAMP, 15th Brazilian Logic Conference, and 14th Latin-American Symposium on Mathematical Logic, Paraty, Brazil, 11–17 May.

**ARGMAS:** Fifth International Workshop on Argumentation in Multi-Agent Systems, Estoril, Portugal, 12–13 May.

**INTERVAL PROBABILITY:** Workshop on Principles and Methods of Statistical Inference with Interval Probability, Durham, 12–16 May.

**DL:** 21st International Workshop on Description Logics, Dresden, 13–16 May.

**FEW:** Fifth Annual Formal Epistemology Workshop, Madison, Wisconsin, 14–18 May.

**UR:** Special Track on Uncertain Reasoning, 21st International Florida Artificial Intelligence Research Society Conference, Coconut Grove, Florida, 15–17 May.

**AI PLANNING AND SCHEDULING:** A Special Track at the 21st International FLAIRS Conference, Coconut Grove, Florida, 15–17 May.

**RSKT:** Rough Sets and Knowledge Technology, Chengdu, 17–19 May.

**MANYVAL:** Applications of Topological Dualities to Measure Theory in Algebraic Many-Valued Logic, Milan, 19–21 May.

**NAFIPS:** North American Fuzzy Information Processing Society Annual Conference, Rockefeller University, New York, 19–22 May.

**ISMIS:** The Seventeenth International Symposium on Methodologies for Intelligent Systems, York University, Toronto, Canada, 20–23 May.

**WCB:** Workshop on Constraint Based Methods for Bioinformatics, Paris, 22 May.

**APPROXIMATE INFERENCE:** PASCAL 2008 Workshop on Approximate Inference in Stochastic Processes and Dynamical Systems, Cumberland Lodge, 27–29 May.

**COMMA:** Second International Conference on Computational Models of Argument, Toulouse, 28–30 May.

**AI:** 21st Canadian Conference on Artificial Intelligence, Windsor, Ontario, 28–30 May.

**EXPRESSIONS OF ANALOGY:** Faculty of Social and Human Sciences, New University of Lisbon, 29–31 May.

## JUNE

**AREA:** International Workshop on Advancing Reasoning on the Web: Scalability and Commonsense, Tenerife, 1 June.

**WCCI:** IEEE World Congress on Computational Intelligence, Hong Kong, 1–6 June.

**META-ANALYSIS:** Synthesis and Appraisal of Multiple Sources of Empirical Evidence, Statistical and Applied Mathematical Sciences Institute, North Carolina, 2–13 June.

**CSHPS:** Canadian Society for History and Philosophy of Science, University of British Columbia, Vancouver, 3–5 June.

**CI:** Computability in Europe 2008: Logic and Theory of Algorithms, University of Athens, Athens, 15–20 June.

**IIS**: Intelligent Information Systems, Zakopane, Poland, 16–18 June.

**DM**: SIAM Conference on Discrete Mathematics, University of Vermont, Burlington, Vermont, 16–19 June.

**LOGICA**: Hejnice, Czech Republic, 16–20 June.

**IEA-AIE**: 21st International Conference on Industrial, Engineering and Other Applications of Applied Intelligent Systems, Wroclaw, Poland, 18–20 June.

**HOPOS**: Seventh Congress of the International Society for the History of Philosophy of Science, Vancouver, Canada, 18–21 June.

**HDM**: Multivariate statistical modelling and high dimensional data mining, Kayseri, Turkey, 19–23 June.

**EPISTEME**: Law and Evidence, Dartmouth College, 20–21 June.

**IPMU**: Information Processing and Management of Uncertainty in Knowledge-Based Systems, Malaga, Spain, 22–27 June.

**MED**: 16th Mediterranean Conference on Control and Automation, Ajaccio, Corsica, 25–27 June.

**ESPP**: European Society for Philosophy and Psychology, Utrecht, 26–28 June.

**PHILOSOPHY OF PROBABILITY**: Graduate Conference, London School of Economics, 27–28 June.

**DGL**: Second Workshop in Decisions, Games and Logic, Institute for Logic, Language and Computation, Amsterdam, 30 June – 2 July.

**EWRL**: European Workshop on Reinforcement Learning, INRIA, Lille, 30 June–3 July.

## JULY

**WoLLIC**: 15th Workshop on Logic, Language, Information and Computation, Edinburgh, 1–4 July.

**LOFT**: 8th Conference on Logic and the Foundations of Game and Decision Theory, 3–5 July.

**LOGIC COLLOQUIUM**: Bern, Switzerland, 3–8 July.

**ICML**: International Conference on Machine Learning, Helsinki, 5–9 July.

**SMT**: 6th International Workshop on Satisfiability Modulo Theories, Princeton, 7–8 July.

**COMPUTATION AND COGNITIVE SCIENCE**: King's College, Cambridge, 7–8 July.

**NEGATION AND DENIAL**: Philosophy Centre, University of Lisbon, 7–8 July.

**CAV**: 20th International Conference on Computer Aided Verification, Princeton, 7–14 July.

**INDUCTION:** Historical and Contemporary Approaches, 5th Ghentian Conference in the Philosophy of Science, Centre for Logic and Philosophy of Science, Ghent, 8–10 July.

**BAYESIAN MODELLING:** 6th Bayesian Modelling Applications Workshop, Helsinki, 9 July.

**UAI:** Uncertainty in Artificial Intelligence, Helsinki, 9–12 July.

**COLT:** Conference on Learning Theory, Helsinki, 9–12 July.

**CLASSICAL LOGIC AND COMPUTATION:** Reykjavik, 13 July.

**WCP4:** Fourth World Congress of Paraconsistency, Melbourne, 13–18 July.

**BPR:** The 1st International Workshop on Bit-Precise Reasoning, Princeton, 14 July.

**ITSL:** Information Theory and Statistical Learning, Las Vegas, 14–15 July.

**IKE:** International Conference on Information and Knowledge Engineering, Las Vegas, 14–17 July.

**DMIN:** International Conference on Data Mining, Las Vegas, 14–17 July.

**NORMAS:** 3rd International Workshop on Normative Multiagent Systems, Luxembourg, 15–16 July.

**DEON:** 9th International Conference on Deontic Logic in Computer Science, Luxembourg, 15–18 July.

**NCPW:** 11th Neural Computation and Psychology Workshop, Oxford, 16–18 July.

**PROOF THEORY:** Workshop on Logic, Foundational Research, and Metamathematics II, WWU Institute for Mathematical Logic, Münster, 18–19 July.

**MOCHART:** Fifth Workshop on Model Checking and Artificial Intelligence, Patras, Greece, 21–22 July.

**WIGSK:** Inference methods based on graphical structures of knowledge, Patras, Greece, 21–22 July.

**ISBA:** 9th World Meeting, International Society for Bayesian Analysis, Hamilton Island, Australia, 21–25 July.

**MODEL SELECTION:** Current Trends and Challenges in Model Selection and Related Areas, University of Vienna, 24–26 July.

**ICHST:** XXIIIrd Congress of History of Science and Technology, Budapest, 26–31 July.

**ESARM:** Workshop on Empirically Successful Automated Reasoning for Mathematics, Birmingham, UK, 26 July–2 August.

**FIRST FORMAL EPISTEMOLOGY FESTIVAL:** Conditionals and Ranking Functions, Konstanz, 28–30 July.

## AUGUST

**CONFERENCE:** Language, Communication and Cognition, University of Brighton, 4–7 August, Brighton, UK.

**ESSLLI:** European Summer School in Logic, Language and Information, Freie und Hansestadt Hamburg, Germany, 5–15 August.

**BLAST:** Boolean Algebra, Lattice Theory, Algebra, Set Theory and Topology, Denver, 6–10 August.

**IJCAR:** The 4th International Joint Conference on Automated Reasoning, Sydney, 10–15 August.

**ICT:** The Sixth International Conference on Thinking, San Servolo, Venice, 21–23 August.

**COMPSTAT:** International Conference on Computational Statistics, Porto, Portugal, 24–29 August.

**FSKD:** The 5th International Conference on Fuzzy Systems and Knowledge Discovery, Jinan, China, 25–27 August.

**LSFA:** Third Workshop on Logical and Semantic Frameworks, with Applications, Salvador, Bahia, Brazil, 26 August.

## SEPTEMBER

**IVA:** The Eighth International Conference on Intelligent Virtual Agents, Tokyo, 1–3 September.

**GRANDEUR OF REASON:** Rome, 1–4 September.

**10TH ASIAN LOGIC CONFERENCE:** Kobe University, Japan, 1–6 September.

**COMSOC:** 2nd International Workshop on Computational Social Choice, Liverpool, 3–5 September.

**KES:** 12th International Conference on Knowledge-Based and Intelligent Information & Engineering Systems, Zagreb, 3–5 September.

**ICANN:** 18th International Conference on Artificial Neural Networks, Prague, 3–6 September.

**BLC:** British Logic Colloquium, Nottingham, 4–6 September.

**SMPS:** Soft Methods for Probability and Statistics, 4th International Conference, Toulouse, 8–10 September.

**AiML:** Advances in Modal Logic, LORIA, Nancy, France, 9–12 September.

**CAUSALITY AND PROBABILITY IN THE SCIENCES**

University of Kent, Canterbury UK, 10–12 September

**COLLOQUIUM LOGICUM:** The biennial meeting of the German Society for Mathematical Logic, Technische Universitaet Darmstadt, 10–12 September.

**LOGIC OF CHANGE, CHANGE OF LOGIC:** Prague, 10–14 September.

**NMR:** Twelfth International Workshop on Non-Monotonic Reasoning, Special Session on Foundations of NMR and Uncertainty, Sydney, 13–15 September.

**ICAPS:** International Conference on Automated Planning and Scheduling, Sydney, 14–18 September.

**ECML PKDD:** The European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases, Antwerp, Belgium, 15–19 September.

**SPATIAL COGNITION:** Schloss Reinach, Freiburg, 15–19 September.

**CSL:** 17th Annual Conference of the European Association for Computer Science Logic, Bertinoro, Italy, 15–20 September.

**PGM:** The fourth European Workshop on Probabilistic Graphical Models, Aalborg, Denmark, 16–19 September.

**HAIS:** 3rd International Workshop on Hybrid Artificial Intelligence Systems, Burgos, Spain, 24–26 September.

## OCTOBER

**SUM:** Second International Conference on Scalable Uncertainty Management, Naples, 1–3 October.

**SETN:** 5th Hellenic Conference on Artificial Intelligence, Syros, Greece, 2–4 October.

**REASON, ACTIVISM, AND CHANGE:** University of Windsor, 3–5 October.

**ICAI:** The 1st International Conference on Advanced Intelligence, Beijing, 19–22 October.

**MICAI:** 7th Mexican International Conference on Artificial Intelligence, Mexico City, 27–31 October.

**MDAI:** Modeling Decisions for Artificial Intelligence, Barcelona, 30–31 October.

## DECEMBER

**ICLP:** 24th International Conference on Logic Programming, Udine, Italy, 9–13 December.

## §6

### JOBS

**IHPST, PARIS:** Postdoctoral Fellowship, History and philosophy of logic / history and philosophy of science, deadline 1 April.

**THEORETICAL PHILOSOPHY, KONSTANZ:** Professorship, deadline 11 April.

**PHILOSOPHY, AUCKLAND:** Lecturer, deadline 14 April.

**PHILOSOPHY OF SCIENCE, CAMBRIDGE:** 2-year teaching position, Department of History and Philosophy of Science, deadline 17 April.

**PHILOSOPHY OF SIMULATION:** Professorships, Stuttgart, deadline 30 April.

## §7

### COURSES AND STUDENTSHIPS

#### Courses

##### MA IN REASONING

An interdisciplinary programme at the University of Kent, Canterbury, UK. Core modules on logical, causal, probabilistic, scientific and mathematical reasoning and further modules from Philosophy, Psychology, Computing, Statistics and Law.

**ALGORITHMIC DECISION THEORY:** MCDA, Data Mining and Rough Sets, Doctoral School, Troina, Italy, 11–16 April.

**EASSS:** 10th European Agent Systems Summer School, New University of Lisbon, 5–9 May.

**LOGIC SCHOOL:** State University of Campinas, Brazil, 7–9 May.

**LOGIC AND FORMAL EPISTEMOLOGY:** Summer school for undergraduates, Department of Philosophy, Carnegie Mellon University, Pittsburg, 9–27 June.

**SIPTA:** 3rd SIPTA School on Imprecise Probabilities, Montpellier, 2–8 July.

**PROBABILISTIC CAUSALITY:** Central European University, Budapest, 21 July–1 August.

**GSSPP:** Geneva Summer School in the Philosophy of Physics, 22 July–8 August.

**ESSLLI:** European Summer School in Logic, Language and Information, Hamburg, 4–15 August.



**MATHEMATICS, ALGORITHMS, AND PROOFS:** Summer School, Abdus Salam International Centre for Theoretical Physics, Trieste, 11–29 August.

**CAUSALITY STUDY FORTNIGHT**

University of Kent, Canterbury UK, 8–19 September

## **Studentships**

**HELSINKI:** Probabilistic inference, machine learning and data analysis, PhD studentship, deadline 15 April.

## **Acknowledgements**

*The Reasoner* is a development of the [prolognet](#) academic network supported by the [Leverhulme Trust](#).