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§1  
EDITORIAL

I am very happy to return as guest editor for *The Reasoner*. Thank you to Jon Williamson, Federica Russo, and Lorenzo Casini for all their work on this issue—and indeed also for being the other members of our very happy causality group at Kent, which welcomes Jan Lemeire, joining us from Brussels for a couple of months.

This month I have chosen to interview Hannes Leitgeb. He is a professor in both the maths and philosophy departments at Bristol University. He is a very busy and

active researcher, who still finds time to be very helpful to junior colleagues. I will always be grateful for his helping me to figure out *what* to do the first time I was faced with apparently quite opposed referees reports on one of my early papers—my first experience of the occasional frustrations of the peer review process.

With research interests in logic, epistemology, philosophy of mathematics, philosophy of language, cognitive science, philosophy of science, and history of philosophy including Logical Positivism, Carnap, and Quine, there is very little that is reasoning-related that Hannes doesn't work on. He does not see maths and philosophy as separate, but is instead thoroughly committed to the use of mathematical methods in philosophy. My idea in interviewing Hannes was to have someone who does not use such methods interview someone utterly immersed in them, asking him to explain the purpose of such research to those who might be mystified. So now I shall let Hannes explain his work to you in his own way.



Phyllis Illari  
Philosophy, Kent

## §2 FEATURES

### Interview with Hannes Leitgeb

Hannes Leitgeb is a Professor in the Departments of Philosophy and Mathematics at the University of Bristol.

Phyllis Illari: Hello, and thank you for agreeing to talk to *The Reasoner*. Perhaps it's best to start with you introducing your work in your own words. How would you describe what you do?

Hannes Leitgeb: I just realized I had never considered before whether there was any common thread that runs through the whole of my work. If there is one, then it is on the more methodological side really: I like to apply mathematical methods in order to solve philosophical problems. I call this 'mathematical philosophy'. Very occasionally one has some cool mathematical theorem, and one then looks for the right sort of problem to which it could be applied. But in the great majority of cases one simply comes across a philosophical theory or argument or thesis or maybe even just a clever example, and some mathematical structure presents itself—well, 'presents itself' after a lot of work!

PI: So do you think formal methods—sorry, *mathematical* methods—are necessary for philosophy?

HL: Overall, and ultimately, mathematical methods are necessary for philosophical progress, yes. But of course there can be points in a philosophical argumentation at which there is no payoff of applying such methods. And while I do not think that there is any area of philosophy that is 'beyond mathematical methods', in some areas they do not pay off as yet because these areas are not quite developed enough. Or that's at least the diagnosis of a mathematical philosopher!

PI: How would you characterize the main aim in your work?

HL: First, clarity. Clarifying what we mean by this and that, and which conclusion rests on what philosophical premise. But once this is done, the main aim is to settle philosophical questions and to determine whether some interesting philosophical theses are true or false. Is it possible to justify Bayesianism 'objectively' by considerations to do with minimizing one's expected distance from the truth? Are there true mathematical statements that are humanly unprovable for principled reasons rather than for just pragmatic ones? Is there a semantics that is compositional, validates classical logic, and yet is based on mere similarity of meanings rather than the identity of meanings? Some questions

can also be motivated historically: For example, can we state simple, transparent and jointly necessary and sufficient conditions under which Carnap's method of abstraction in his *Logical Structure of the World* yields exactly the intended results? And so on. (By the way, the answers are: Probably. Unknown. No. Yes.)

PI: What do you think is the most important function of researchers working on reasoning?

HL: Of course, there is empirical research on reasoning, and there is normative research, and naturally their function can differ quite substantially. But then again they can also go very well hand in hand. Back in my days in Salzburg, we had a very interesting project with colleagues from cognitive psychology: The idea was to test empirically whether people comply with the normative standards for nonmonotonic reasoning or conditional logic. While I was supposed to offer logical and philosophical expertise, my colleagues would create and execute the experiments. Boy, I learned a lot just by watching them tear apart my excessively naïve suggestions for how to set up the relevant experiments based on the usual logical toy examples! Later on, some really good psychological work emerged from this, long after I had gone elsewhere—and maybe because of that. Additionally, there is the deep question of whether the neat descriptive-normative distinction that we philosophers like to employ, and usually rightly so, still applies on a more foundational level. Hans Rott has a very nice paper on this which appeared in a special issue of *Studia Logica* on 'Psychologism in Logic?': as is well-known, there is pretty much a canonical answer to the question 'what are the right axioms that describe rational qualitative one-shot belief revision?'—the standard AGM axioms. But in spite of a lot of effort and ingenuity which got invested into the search for a similarly canonical axiom system of iterated belief revision—where beliefs are revised in light of a proper sequence of evidential propositions—so far not much more than a number of mutually exclusive methods of iterated revision has emerged for which it is very unclear whether any of them can be excluded on grounds of rationality and what this would even mean. Rather, and this is one interpretation that Hans puts forward, it might be merely a matter of personality which of these schemes of iterated belief revision an agent chooses or happens to instantiate. And this is the outcome of what originally was supposed to be a purely normative study of belief revision! On a similar note, in my current work, it turns out to be possible to define qualitative rational belief explicitly in terms of probabilistic degrees of belief, so that belief retains all of its usual logical closure properties; from the probabilistic perspective, qualitative belief is even determined uniquely, however only up to a cautiousness threshold that can be chosen freely from the open interval (1/2, 1). Once again, there do not seem to be any normative grounds on which any threshold number



would be preferable to another—the normative theory seems to disclose a parameter on which rationality remains silent and about which only empirical studies on actual agents might be able to tell us more.

PI: What do you think is the most important current issue in reasoning?

HL: I certainly wouldn't want to speak for anyone else here, but for me personally it is the integration of logical concepts and logical methods of reasoning with probabilistic ones. For example, in a current project of mine to which I am very much addicted at present, every standard probability measure determines 'its set of qualitative beliefs', where the resulting class of believed propositions is closed under logical consequence and conjunction, each believed proposition has a probability greater than 1/2, but where believed propositions are not bound to have a subjective probability of 1. What is so amazing about this is the way in which the class of believed propositions, as being given by the probability measure, is determined: simply assume that every believed proposition has a probability greater than some fixed threshold above 1/2; assume all the AGM axioms of belief revision to hold for (conditional) belief; and voilà, there is only one way to define belief in terms of a probability measure such that all of this is the case. With that in place, it becomes possible to apply probabilistic concepts to qualitative beliefs and vice versa: For example, one can show that if the qualitative beliefs are so and so, then a particular proposition must incrementally confirm another; one can determine whether one probability measure generates more true beliefs than another; how degrees of belief relate to knowledge, and so on. Other people have other ways of putting logic and probability theory together (see the [Progic conference series](#)), and much more is to come. It is about to be a very exciting area.

PI: What are the really interesting issues in philosophy of maths? Is it all about what a number is?

HL: No, it's not, but it's a good question. First of all, as I see it, there is classical philosophy of mathematics, the most recent brand of which is probably structuralism; there questions like 'what is a number?' do get asked. Since I like to think of myself as a structuralist about mathematics, I also like very much what Stewart Shapiro and other structuralists tell us about mathematical entities. This said, I do think that the power of theory-building by means of mathematical methods has not been exploited sufficiently: there is not enough mathematical philosophy in that part of philosophy of mathematics. Secondly, philosophy of mathematics can be done much in the way in which most of philosophy of physics has been done for a while now: studying recent mathematical theories and areas very closely and investigating them from a more or less methodological point of view. A related recent trend is to take mathematical practice more seriously: for example, what do

the 'real mathematicians mean by proof and provability?' The answer differs significantly from what proof theorists mean by these terms.

PI: How do you find the challenge of such an active academic life and being the father of a young family?

HL: It is a challenge, to be honest. Children are so lovely that one wants to spend a lot of time with them, but that's time that one previously used for academic purposes, at least partially. On the brighter side, I happened to have two of my best philosophical ideas shortly after our two kids were born: maybe this was not a lucky coincidence?

PI: What are your plans—what happens next?

HL: As far as research goes, I sent off a very long article in two parts on a probabilistic semantics for counterfactuals recently, and I am working on an article on conditional expected chance vs. expected conditional chance with a colleague from Austria. I will keep working on criteria of identity and abstraction principles, I am co-authoring a paper on an axiomatic theory of propositions and type-free truth, and an article on a new form of Logicism about mathematics. On the more practical side, within the next two months or so I hope to have an answer to the question of *where* I will find myself from autumn of this year. But that's not a philosophical question, and mathematical methods are not of help here either!

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## On Reconstructing Proofs in Paraconsistent Mathematics

A formal goal for the *paraconsistent foundations of mathematics* is to reconstruct large fragments of mathematical theories in a strong, inconsistency-tolerant logic. The point is to show that the core facts of mathematics are provable even if some (but not all!) contradictions are provable, too—for example, that  $1 + 1 = 2$  holds even if arithmetic is inconsistent. (Another goal of paraconsistent mathematics is to discover *new* theorems—but this calls for a reliable, coherent and familiar background of uncontroversial mathematics already founded.)

A paraconsistent mathematician works out proofs in logics weaker than classical, beginning by examining the classical proofs (in, e.g., Bourbaki's *Elements*) and checking that all the inferences used are acceptable from a paraconsistent viewpoint. In many cases, there will be some non-paraconsistent inferences. If a theorem is like a location on a map, and a proof is a route from where you are to that location, then these are like roadblocks. To get to our proposed destination, we have

to find another way around. I indicate below a couple of strategies for how this is done. A salient issue is how to grapple with arguments by contradiction. A classical proof may argue for a (simple) theorem like this.

We know that, for every number  $n$  less than some number  $m$ , it is not the case that  $n < n$ . *Therefore*: It is not the case that  $m < m$  either. *Proof*: Suppose  $m < m$ . Then  $m$  is one of the numbers less than  $m$ , with  $m < m$ . This contradicts what we know about numbers less than  $m$ . Since contradictions are never classically tenable, neither was the assumption that  $m < m$ . Therefore  $m$  is not less than itself.

Such an argument is an indirect proof. Now, since in a non-classical setting some contradictions can be tenable, this reasoning is insufficient. Even some who are unconcerned with inconsistency have wondered whether indirect proofs give us enough reason to believe their conclusions. But, given the law of excluded middle—which is valid in most paraconsistent logics—there is a way to adapt the reasoning in a way that is sufficient, as follows.

*Proof*: Either  $m < m$  or not. If it is not the case that  $m < m$ , we are done. If it is the case that  $m < m$ , then  $m$  has the property that all the numbers less than  $m$  have, namely, not being less than itself. So in either case  $m$  is not less than itself. These are the only two possibilities, so  $m$  is not less than itself and the theorem is proved.

This replaces a *reductio* with an argument-by-cases and a *consequentia mirabilis*: Even if the theorem is false, it is still true! Not only do we re-obtain the desired theorem in our stronger paraconsistent framework, but the new proof has given us a better *reason* to think that it is true. It is true not merely on the basis of some background contradiction. It is true because it follows from structural fact about numbers, and it follows no matter what—even if it is false. The new proof is more informative.

A very strong version of this method is by absurdity operator. From an absurdity, call it BAD, absolutely everything follows; prove BAD and you prove any sentence at all. We can define the number 0 as the number of all the objects that are BAD. Since BAD is absurd, there are no such objects. (If there were, there still would not be.) This done, a stronger kind of proof than the one shown above is possible: If at any time during a proof we derive BAD, then the theorem follows directly. In Routley's 1977 paraconsistent set theory, for instance,  $0 = 1$  implies BAD, proving that  $0 = 1$  is absolutely false.

There is a philosophical point to consider about reworking proofs. A proof is a systematic process leading to an endpoint, the theorem to be proved; so it is interesting to ask when two processes with exactly the same result count as the same, and when they are actually different. In law we certainly attend to this sort of consideration, when we distinguish manslaughter from murder. In mathematics there is still a great deal about process, as opposed to outcome, to be formally explored. Moreover, suppose we prove, by a very new and unusual argument, that  $1 + 1 = 2$ . If the process is different enough from any known classical counterpart, can we even be sure we have proven the same fact?

A second philosophical item is this. Radically new theorems are obtained in the course of devising new proofs for old theorems, as a by-product. For example, say we want to recapture a proof that all functions have some property, but are stuck with an anomalous, inconsistent object that seems to be a function and yet lacks that property. The proof is not necessarily in trouble. In some cases this means we have discovered a new kind of function that delivers novel computational power or unusual algebraic structure. In time, this turns out to be only the most obtrusive member of a large class. What we were calling ‘all the functions’ in classical mathematics has been shown to be a subclass of the whole. But such proofs-and-counterexamples methodology is familiar from the history and practice of mathematics. This suggests that, for all its novelty and aspirations to be a foundation, paraconsistent mathematics is just more mathematics.

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## How to Use a Valid Derivers License

Some *rules* require a *license*. In order to follow certain rules of traffic one needs a valid drivers license. Other rules of traffic, such as those governing pedestrians, require no such license. And what holds for drivers holds as well, *mutatis mutandis*, for those who aim to deduce conclusions from premises—*derivers*.

Of course, in addition to a license, the deriver of a conclusion requires a set of assumptions—statements taken as either obviously true needing no further justification, or already derived, or taken to be true for the sake of the deduction. These are the premises (hidden or explicit). One rule of derivation (some traditional logicians, especially Leibniz, would say the main rule) is what is known as the *dictum de omni et nullo*: What is affirmed or denied of all of something is likewise affirmed or denied of what that something is affirmed of (see J. Oesterle 1963: *Logic*, Englewood Cliffs, NJ: Prentice-Hall, 182, and F. Sommers and G. Englebret-

sen 2000: *An Invitation to Formal Reasoning*, Aldershot: Ashgate, 114–135).

In the 19th century the *dictum* was often been taken to be a rule of elimination (of middle terms). (See J. Green 2009: The Problem of Elimination in the Algebra of Logic, *Perspectives on the History of Mathematical Logic*). Alternatively, it was seen as a rule of *substitution*. Boole, for example, read the rule as *equals can be substituted for equals* (see J. Corcoran and J. Woods 1980: Boole's Criteria for Validity and Invalidity, *Notre Dame Journal of Formal Logic*, 21, 609–638).

My claim is that elimination is only a consequence of the application of the *dictum*, which is a rule of substitution. It permits the *substitution* of a term in one premise for the other term in that premise whenever that other term occurs in a different premise *under specificable conditions*. The essential condition is that there is a *license* for such an application. I borrow here Ryle's notion of an "inference license," a natural law essential for scientific explanations based on evidence; such laws are always stated in the form of universal propositions (1971: 'If, So and Because,' *Collected Papers*, vol. 2, London: Hutchinson, 234–249). The *dictum* cannot be applied without a proper license. And here is the important point: Every license for the correct application of the *dictum* is a universally quantified premise (hidden or otherwise).

So every license is a premise (viz., a universally quantified premise). But it's important to keep in mind that, since no premise is a rule (that's what Achilles taught the Tortoise), no license is a rule. Properly understood, the *dictum* allows the substitution of one term for another under the conditions specified above. A valid deduction, then, requires (1) a pair of premises, (2) a rule applicable to those premises, and (3) if the rule being used is the *dictum*, a license legitimizing the rules application. It goes without saying that not all deductions require use of the *dictum*. A few examples of the license should make its use a bit clearer. Consider the valid argument 'All my relatives are rude, and some of the guests at the party were my relatives; so, some of the guests at the party were rude.' Notice that the conclusion is nothing more than the second premise with the term 'rude' substituted for 'my relatives'. This substitution of a (major) term for a (middle) term is licensed by the first premise (a universal). The license allows the substitution of the predicate-term of a universal for the subject-term of that universal in any other statement in which that subject-term occurs *undistributed*. A term is undistributed in a statement just in case the total number of universal quantifiers and negations in whose ranges it occurs is even (including zero), otherwise it is distributed. In the argument at hand, the major term can be substituted for the middle because that middle term occurs undistributed in the second premise. The first premise, a universal, licenses this substitution. (For

more on this see C. Williamson 1971: Traditional Logic as a Logic of Distribution Values, *Logique et Analyse*, 14, 729–746, and T. Parsons 2006: The Doctrine of Distribution, *History and Philosophy of Logic*, 27, 59–74).

Next consider the argument 'All terrorists are fools; therefore, every supporter of a terrorist is a supporter of a fool'. The premise is universal; so it *could* serve as a license for substituting 'fool' for 'terrorist'. But such a use would require an additional premise, one in which the term 'terrorist' occurs undistributed. In fact, there is just such a premise. It is tautological and thus suppressed (hidden): 'Every supporter of a terrorist is a supporter of a terrorist. The explicit premise, the license, permits the deriver to substitute 'fool' for the undistributed token of 'terrorist' in the hidden premise to yield the conclusion.

It can be shown that even inferences such as those involving universal instantiation, existential generalization, Leibniz's law governing identity, and even inferences in the logic of statements (e.g., *modus ponens*, *modus tollens*, *hypothetical syllogism* are versions of the *dictum*) can all be seen as involving the use of the *dictum* applied in the presence of an appropriate universal premise (see chapter 7 of Sommers and Englebretsen, *op cit*). If the *dictum* is understood as a rule of substitution, then it can only be applied if one of the premises to which it is applied is a universal affirmation or denial. The *dictum* then allows the substitution of the predicate term for the subject term of that premise in another premise in which that subject term is undistributed. The substitution cannot be applied under just any circumstance. It must be licensed by that universal premise—a deriver's license.

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## Thomas Reid and the Persistence of Common Sense

It is not to be expected that the 300<sup>th</sup> birthday of the 18th century Scottish philosopher Thomas Reid (1710–1796) will receive disproportional media-attention in 2010. He even seems a little forgotten today, but in the 18<sup>th</sup> and 19<sup>th</sup> century he was hardly less prominent than his famous contemporary and compatriot David Hume. With his philosophy of common sense he fought the prevailing epistemic views of his era, if not a mainstream tradition in western philosophy. He deeply influenced C.S. Peirce and the pragmatist movement of the 19<sup>th</sup> century, and more importantly, his ideas lie behind much of current research in Artificial Intelligence.

Thomas Reid owes much of his prestige to the fact that he severely criticized famous predecessors and contemporaries, such as the rationalist philoso-

pher Descartes and the empiricist philosophers Locke, Berkeley and Hume. Encouraged by the successes of the natural sciences in understanding the “outer world”, these philosophers started scrutinizing the “inner world”, focusing on perception and mental representations, and developing “theories of ideas”. According to Reid they all, each in his own way, wrongly placed perceptions and mental representations between the objects in reality and the subjects who perceive this reality, thus creating an unnecessary gap between subject and object, inner and outer world, causing paradoxes, solipsism or skepticism. Some mistrusted the senses or at least part of the sensorial input (Descartes), or made experiences of color, taste and sound “secondary” to real or “primary” properties of the world (Locke). Others claimed that material objects in the outer world didn’t exist, were not mind-independent (Berkeley), or in fact not-knowable to the subject (Hume). At the best, reality remained hidden behind a “veil of perception”.

By contrast, Reid embraced a direct realism, that precedes more sophisticated positions in the Scientific Realism Debate today. There is an external world, which is knowable and our ideas do not close the way to the “outside”, but open it correctly. God has given mankind some mechanisms that we can rely on in order to gain knowledge, such as the principle of induction and the ability to see some self-evident truths. These and other “axioms” were proposed and elaborated by Reid, building up a theory of common sense that accounts for the fact that we have sensations, as a part of our *sensus communis*, which is not only a precondition for humans to reason with each other rationally, but also a sufficiently reliable basis for philosophical analysis. But Reid did more than just combat the spirit of the times. He opposed an entire tradition that dominated the history of Western ideas since the pre-Socratics and that has reached a peak in contemporary naturalistic / physicalist epistemology. In this tradition the world has lost much of its intuitive and familiar nature; our everyday experiences, as well as the concepts and natural categories we use to explain these experiences and to understand ourselves, have little in common with the underlying mechanisms, abstract principles and laws that govern the “real” world, studied by science and described with the scientific vocabulary.

The gap deepened in the 20<sup>th</sup> century, especially since the rise of philosophy of mind and the neurosciences. Paul Churchland notoriously attacked a tradition which is sometimes pejoratively labeled as folk psychology: people try to understand, explain and predict the behavior of themselves and others in terms of (causally relevant) factors such as motives, intentions, beliefs, morals and abilities. Churchland advocates a radical “eliminative materialism” in these matters, claiming that the whole idea of folk psychology, including the concept

of consciousness fully misrepresents the human mind and its internal processes. Progress in neuroscience will lead to its elimination in the end.

Despite the dominance of naturalist philosophy and Churchland’s eliminative materialism, the idea of common sense—albeit in different guises—appeared persistent and successful in the project of AI from the very start. The intuitive concepts and categories we use to understand our environment and ourselves, to represent our knowledge, and to reason with it, are encoded and exploited in intelligent systems, rather than being suppressed or eliminated. Founding father John McCarthy published his seminal paper “Programs with common sense” in 1959 and introduced his famous Advice Taker, a milestone in knowledge representation / symbolical AI. Another good example is the area of qualitative reasoning.

It uses the fact that people reason about the world that surrounds them with only common sense notions of time and space, force, movement and acceleration, without the use of numerical information or solving differential equations, and implements these concepts in systems for commonsense reasoning. Patrick Hayes’ *Naïve Physics Manifesto* (1978) highlights this tradition. Also noteworthy are the CYC-project that attempts to develop a wide-ranging knowledge base and ontology of everyday knowledge to perform human-like reasoning, and the more recent Open Mind Common Sense project that was launched at MIT in 1999. But, no doubt the most pervasive example in AI is the subfield of (multi-) agent systems, where agents operate “autonomously” in a complex environment, have mental states with beliefs, desires and intentions, and are even supposed to show moral behavior and emotions. The idea that the behavior of a system is explained and understood in terms of intentional subjects is not only in full accordance with the aforementioned folk psychology, but in a way it even restores or revalues elements of Aristotelian teleology, that were banned since the Scientific Revolution in the 17<sup>th</sup> century.

Of course the idea of common sense has many uses and connotations that were not covered or foreseen by Reid. But, despite the fact that AI is still troubled by the sometimes overemphasized Cartesian body/mind problem, and Churchland’s eliminative materialism undoubtedly has become influential as well, the tradition that was driven by Reid is highly relevant today, and particularly this year a modest attention for his legacy seems justified.

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## On Forgetting ‘that’

In my (Slater 2009: ‘Some New Propositional Inferences’, *The Reasoner* 3.11, 7-8) I pointed out that there are everyday forms of speech involving reference to propositions that had been forgotten in main-line formal logic. Here I show that the amnesia is more widespread, and has affected, and still affects, many other central things, not just in formal logic. For there are propositional identity statements like ‘What Galileo said was that the earth moves’ which were not acknowledged in Donald Davidson’s discussion of ‘saying that’ (1968: ‘On Saying That’, *Synthese* 19, 130-146). Davidson’s ‘paratactic’ division of ‘Galileo said that the earth moves’ was into ‘Galileo said that’ (with ‘that’ a demonstrative) and ‘The earth moves’. But that is not where the division is: the ‘that’ goes with the following clause. The identity statement just mentioned, for instance, licenses inferences such as that from ‘No one believed what Galileo said’ to ‘No one believed that the earth moves’. Likewise ‘Galileo said that the earth moves’, with the identity statement ‘What I said was that the earth moves’ yields ‘Galileo said what I said’. So Davidson’s construal was well off the mark, making it very puzzling why it was thought even worthy of consideration for so long.

But another area affected suggests an answer to this question. For in the most studied formal languages in twentieth century logic there are no complementisers such as ‘that’. And these languages have had a very exalted place in the modern philosophical community. One of the formal difficulties this has generated arises in connection with the possibility of replacing propositional operators by predicates. Thus we find (Holbach, V., Leitgeb, H. and Welch, P. 2003: ‘Possible Worlds Semantics for Modal Notions Conceived as Predicates’, *Journal of Philosophical Logic* 32, 179-180):

Predicates applied to singular terms yield formulae, while operators need to be combined with formulae to give new formulae. Roughly speaking, in natural language and in the case of necessity ‘necessarily’ and ‘it is necessary that’ are operators, whereas ‘is necessary’ is a predicate. ... Montague provided the first [related, formal] result by proving that the predicate version of the modal system T is inconsistent if it is combined with weak systems of arithmetic. From this result he concluded that ‘virtually all of modal logic ... must be sacrificed’ if necessity is conceived as a predicate of [mentioned] sentences. Of course Montague’s verdict does not imply that necessity cannot be treated as a predicate of objects different from sentences, e.g. propositions conceived as language independent entities, but

the result clearly restricted the attractiveness of the predicate approach.

These authors go on:

Nevertheless the operator approach suffers from a severe drawback; it restricts the expressive power of the language in a dramatic way because it rules out quantification in the following sense: There is no direct formalisation of a sentence like ‘All tautologies of propositional logic are necessary’.

But the operator approach rules out much more than this, since it prohibits the reading of ‘that’-clauses as first-order referential terms, with all the consequences that that involves, as I showed before. And a treatment of operators in terms of properties of propositions is immediate once one attends to the basic grammar of such referential terms. For ‘It is necessary that p’ is the same as ‘That p is necessary’. The ‘it’ at the start of an operator expression is just a dangling pronoun waiting on the subject that comes later, in the form of the ‘that’-clause (see, for instance, the O.E.D. under ‘that’ as a conjunction). A more specific point related to this comes from considering how the above authors propose to re-instate a (restricted) form of the predicate approach. They say, amongst other things (*op cit*, 83-184):

It is compatible with our account to conceive  $\square$  either as a predicate of sentences or as a predicate of propositions—as long as the latter share the structure of sentences. ... In our technical treatment we shall apply the predicate  $\square$  to numerical codes of sentences (and we shall identify expressions with their codes).

But clearly if propositions *cannot be given a coding, or numbered*, then the mathematical results these authors derive from their assumptions are entirely academic. One of the supposedly ‘perfect’ features of the languages of recent formal logic has been the lack of overtly contextual elements, such as indexicals and demonstratives. This has made it seem that every proposition expressible in the language is expressible in a distinct sentence, making a numbering of the sentences also a numbering of the propositions. But, as I pointed out before (2008: ‘Horwich versus Tarski’, *The Reasoner* 2.9, 7-8), Gödel’s theorem shows that a kind of indexicality is inescapable in languages that are sufficiently rich to accommodate a Gödel numbering of the sentences within them. And that means that even in standard formal languages there are sentences that may be used to express an unlimited number of propositions, in connection with different, standard and non-standard models. But that means that while the sentences in some

language might be numbered, the propositions those sentences might be used to make are numberless, completely undermining the sort of mathematical analysis the above writers have pursued. Only by shifting to formal languages containing complementisers such as ‘that’ can exact predicative equivalents to operator expressions be found. And so nothing in modal logic need be sacrificed, so long as necessity is conceived of as a predicate of ‘that’-clauses rather than mentioned sentences. Of course, the languages of formal logic do not have to mirror all aspects of natural speech. But when those formal languages misrepresent the structure of the parts of natural speech with which they are concerned, as in the case of the propositional operators above, then a closer attention to how natural language works is obviously required.

Hartley Slater

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### §3 NEWS

#### **Reasoning About Quantum Interaction, 2010–2015**

From June 2010 on, I will be leading a five-year VIDI research project funded by the Netherlands Organisation for Scientific Research (NWO) on “Reasoning about quantum interaction: Logical modelling and verification of multi-agent quantum protocols” at the University of Groningen. We are now in the start-up phase, putting together a new research team for which we are currently recruiting two PhD students and one postdoctoral researcher. The project will be hosted by the Faculty of Mathematics and Natural Sciences in the Institute of Artificial Intelligence (ALICE) and will be conducted in close collaboration with the department of Theoretical Philosophy at the University of Groningen in the Netherlands.

As for classical computing, logic is expected to play an essential role in the understanding of quantum computation and quantum information, and especially in the formal verification of quantum communication protocols. Such multi-agent applications involve quantum information flow and classical knowledge transfer (by classical communication) between the agents. So one of our aims in the proposed VIDI research project is to develop the logical tools for modelling complex situations where different types of informational dynamics (classical and quantum) are combined. Our goal is to develop and use a combined classical-quantum logic for the full specification and formal verification of agent-based quantum protocols for secure communica-

tion. Towards this goal, we propose to use formalisms based on modal logic, especially combinations of dynamic (or temporal) logics and epistemic (or “spatial”) logics. But other logical formalisms, such as probabilistic logic, linear logic and coalgebraic logic (or categorical logic, in general), may also turn out to be useful in this context.

There are three case studies connected to this project. The main task in the first case study is to study from a logical perspective the role of classical knowledge transfer in known protocols such as, e.g., Teleportation, Super Dense Coding and Quantum Secret Sharing. The second case study is associated to the logical study of the (classical and quantum) information flow in protocols dealing with the anonymity of an agent’s identity such as the Quantum Dining Cryptographers and Quantum Electronic Voting. In the final case study of this project, the above mentioned logical tools will be extended into a probabilistic setting fit to specify and verify the correctness properties of quantum protocols with probabilistic features such as Quantum Key Distribution (QKD). The QKD protocol is of particular interest as optical fiber QKD systems are commercially available today. Indeed, the very act of transmitting information over a secure quantum communication channel is no longer restricted to the environment of research laboratories. We are witnessing the dawn of commercially available technology for quantum communication. In practise, quantum cryptography has already been used to secure the transfer of bank information, to transmit ballots in an election, and to secure a computer network. All this indicates that the formal verification of the correctness of these quantum protocols (involving both quantum and classical information flow) is as timely and important as the development of the technology used for their implementation.

For more information about the three open positions, see [here](#).

Sonja Smets

Department of Artificial Intelligence & Department of Theoretical Philosophy, University of Groningen

#### **GoodOD: Ontology, empirically tested, 2010–2012**

Managing and processing large data sets has become a central task for researchers in the medical and biological field as well as for health care professionals. The exponential growth in the amount of knowledge accumulated has been accompanied by an equal proliferation of “ontologies”, models for structuring and representing medical and biological information. Information scientists are now co-operating with philosophers to ensure comparability, consistency, and unity

of that information: The project **GoodOD**, Good Ontology Design, brings together ontologists from philosophy and computer science to investigate the benefits of formal reasoning about medical and biological facts. The GoodOD research group consists of philosophers from the University of Rostock (situated at the Centre for Logic, Philosophy and History of Science Zentrum, **ZLWWG**) and medical informatics researchers from the University of Freiburg. The project is funded by the German Research Foundation (DFG) and initially set out for three years (01/2010-12/2012). The central aim of the project is the development of ontological principles for the formal representation of generic life processes. These modelling principles shall be exemplified by examples from the domains of medicine and biology and transposed into guidelines for ontology developers. The main hypothesis to be examined is that logically and philosophically oriented modelling principles for biomedical terminologies and classification systems constitute an advantage over informal, thesaurus-based approaches, with respect to their precision, reproducibility and maintainability. The project hopes to show that a philosophical foundation is a quality criterion for ontologies.

The philosophical part of the project will analyse the ontologies of fundamental biological and medical entities. It will focus on temporal ontological categories like processes and events as well as on causal properties like dispositions, tendencies and functions that are needed to describe the interactions and processes within the biomedical domain, many of which are probabilistic in kind. A rigorous logical foundation of these issues should also facilitate automated reasoning about such entities. As there is a lively philosophical debate concerning these entities this foundational work will also be of considerable interest in itself.

Based on existing top-level ontologies, the group wants to develop a comprehensive ontological reference framework for “ontology engineers”, to exemplify this framework by means of examples from the medical and the biological domain, and to condense this in a catalogue of modelling guidelines. The usefulness of ontology-based modelling principles shall then be examined empirically. To test the guidelines a selection of terms from prototypical sub-domains of medicine and biology based on fragments of well-established biomedical ontologies is used. Test persons will be set modelling and classification tasks, one group working with the improved guidelines, the control group with standard guidelines. One expected advantage of the improved guidelines is that independently built domain models will show a measurably higher congruence, thus leading to easier compatibility in ontology development.

ment.

**Ludger Jansen**  
Institut für Philosophie, Universität Rostock

**Stefan Schulz**  
Institut für Medizinische Biometrie und Medizinische Informatik, Universität Freiburg

## Philosophy of Language and Linguistics

**Piotr Stalmaszczyk (ed.)** 2010: *Philosophy of Language and Linguistics*, vol. I & II, Ontos Verlag.

Ontos Verlag has just published the following two volumes of interest:

- *Philosophy of Language and Linguistics. Volume I: The Formal Turn*,
- *Philosophy of Language and Linguistics. Volume II: The Philosophical Turn*.

Papers gathered in the two volumes investigate the complex relations between philosophy of language and linguistics, viewed as independent, but mutually influencing, disciplines. They concentrate on the ‘formal’ and ‘philosophical’ turns in the philosophy of language, initiated by Gottlob Frege, with further developments associated with the work of Bertrand Russell, Ludwig Wittgenstein, Kazimierz Ajdukiewicz, W.V.O. Quine, Richard Montague, Pavel Tichý and Richard Rorty. The volumes bring together contributions by philosophers, logicians and linguists, representing different theoretical orientations but united in outlining the common ground, necessary for further research in philosophy of language and linguistics. The papers were submitted and, in most cases, presented at the first International Conference on Philosophy of Language and Linguistics, PhiLang2009, organized by the Chair of English and General Linguistics at the University of Lodz (for a short report on the conference, see *The Reasoner* 3(6)).

The contributors include, among others: Chris Fox, Jaroslav Peregrin, Stefano Predelli, Mieszko Talariewicz (Vol. I), and Eros Corazza, Kepa Korta, Luis Fernandez Moreno, Lars Hertzberg, Michael Morris (Vol. II).

**Piotr Stalmaszczyk**  
English and General Linguistics, University of Lodz

## Argument Assessment in Informal Logic, 30 December

“Argument Assessment in Informal Logic” was organized by the Association for Informal Logic and Critical Thinking (AILACT) and held in New York on the

30th of December. Three papers were presented and commented on.

In his paper, “The Case that all Inference is General”, David Hitchcock argued that all inference is implicitly general, in the sense that any inference to a conclusion from given reasons involves a commitment to parallel inferences from parallel reasons. He defended this claim in two ways. First, the minimal addition that will make an inference formally valid (the denial that the given reasons are true and the conclusion untrue, termed the “associated negajunction” of the inference) needs support, and any adequate support either is or entails a generalization of this minimal addition. Second, the commonly accepted practice of refutation by logical analogy implies that all inference is general. To the objection that some inferences are purely occasional, Hitchcock replied that such inferences require specification of the context in order to understand exactly what the inference is and that, once the context is specified, it becomes clear that occasional inferences are also general.

In commenting, Mark Weinstein pointed to a tension between logical and epistemological perspectives. While agreeing that the notion of a necessarily true universal generalization of an inference’s associated negajunction as the condition for its validity is an advance, Weinstein argued that this notion implies a shift from the universality sought by logic to a more contextually situated epistemological approach to evaluating inferences. He pointed out that the necessity of the non-trivial truth of a universal generalization of an associated negajunction might be a contingent necessity, contrary to Hitchcock’s claim. Replying, Hitchcock conceded this point.

Susana Nuccetell and Gary Seay, in “Reasoning, Normativity, and Experimental Philosophy”, focused on a cognitive-diversity problem that experimentalists take to undermine Goodmanian reflective equilibrium. The cognitive-diversity argument presents the Goodmanian as committed to an implausible form of cognitive relativism. The sort of cognitive diversity invoked in this argument concerns either the logical possibility of divergence in fundamental rules of inference (Stich 1988) or the existence of actual cognitive divergence in basic inference rules among actual thought communities that has supposedly been revealed by psychological experiments (Weinberg, Nichols and Stich 2001). The authors first challenged the empirical grounds experimentalists invoke for the ‘fact’ of cognitive diversity, and then discussed how Goodmanians could respond to the experimentalist claim that such diversity is logically possible.

Commenting, Harvey Siegel found that the paper makes plausible the result that in fact experimental philosophy is scientifically deficient in its attempt to invoke experimental data, but that a more detailed cri-

ture is needed. The authors responded with a critique of studies supporting the claim that East Asians practice holistic/dialectical thought (which accepts contradiction) while Westerners practice analytical/linear thought (which rejects it).

In “Is Epistemic Probability Pascalian”, James B. Freeman considered what it means to say that if the premises of an argument are true, the conclusion is probable—premises relate to conclusions in a non-deductive argument as epistemic probability. Introductory logic texts which present basic probability theory in connection with inductive logic assume that epistemic probability satisfies the laws of the Pascalian probability calculus. However, there are strong arguments against taking the logical, Bayesian personalistic, or limiting frequency interpretations of probability as properly explicating epistemic probability. After reviewing these arguments, Freeman explored whether the propensity interpretation, when supplemented by the non-Pascalian concept of an argument’s weight, gives an adequate account of epistemic probability for at least one type of non-deductive argument.

In response Daniel Cohen conceded Freeman’s argument for incorporating probability theory into argument analysis and evaluation—carefully. However, since statements are probable only relative to data sets, not in isolation, and arguments’ premises provide the relevant contexts for conclusions, dialectical considerations cannot be ignored because responding to possible defeaters often does increase argument strength.

John Hoaglund  
Department of Philosophy and Religious Studies,  
Christopher Newport University

## Causality and Explanation in Physics, Biology and Economics, 18–20 February

The Barcelona 3-day conference on Causality and Explanation was divided into three parts, each part devoted to a particular area (Physics, Biology, Economics). The end of every day’s third talk was followed by an open discussion.

In the first talk, Joseph Berkovitz (commented by Mauricio Suárez) focused on EPR experiments and showed how causal loops pose explanatory challenges for both deterministic and indeterministic Bell-like retro-causal models. Furthermore, he pointed out that local models for EPR in the framework of models such as Cartwright’s are committed to Bell inequalities after all, which are violated by experiments.

By focusing on time (rather than causation itself) Craig Callender (commented by Mathias Frisch) discussed sideways Cauchy problems and probed their implications for the relationship between causation and

lawhood. Leonard Smith (commented by Roman Frigg) considered the inadequacy of models which are built to explain climate change and stressed how those non-linear models, for which causation has been largely discarded as a question of initial conditions, should be used to calculate nonprobabilistic odds for certain events.

By taking into account current population genomics research, Lisa Gannett (commented by Pablo Lorenzano) focused on the use of “race” as a category in current biology. She showed how attributing to race an objective value is central to the development of population genomics research programmes, even if this objective value seems to serve only as heuristic device and cannot be grounded on any mind-independent reality.

In the context of genetics, Ken Waters (commented by Arantza Etxeberria) put forward his notion of “actual difference makers”, i.e., a subset of causes that are actually making the difference in the population under investigation (for instance, DNA).

Elliot Sober (commented by Antonio Diéguez) discussed the question of testability of Fisher’s sex ratio model, which is considered to give an explanation of the percentage of males and females in a population, as an example of a type of apriority that could be specific of biology, or at least of evolutionary theory. He took the model as describing a probabilistic “positive causal factor” that could influence sex ratio.

Caterina Marchionni (commented by Julian Reiss) focused on Network Theory as applied to economics. Here two explanatory desiderata come into play: that the explanandum phenomenon be derived from micro-economic foundations and that the explanation be general.

Jesús Zamora sketched a model for the application of some economic mechanisms in decision making to epistemic and non epistemic assessment of scientific knowledge. In the closing talk Alex Rosenberg (commented by Stephan Hartmann) proposed an answer to the question of why restricted generalizations are explanatory. Starting from a well-known example taken from economics, the “Phillips curve”, he argued that these kinds of regularities are outcomes of Darwinian processes operating in human affairs.

From the open discussions there emerged general attitudes towards Causality in Explanation. The participants seemed to agree on the adoption of a “practice-account” of causation, i.e. an account that involves no metaphysics and does not provide big answers to what causation is. Concerning methodology, authors adopted a “bottom-up” approach towards Explanation; they provided a case study as starting point for their theoretical considerations. Finally, the discussion showed how a “Pluralist” approach to Explanation should be preferred: there is not explanation *simpliciter* but explanations are relative to the context-dependent why questions they answer. The works presented during the Con-

ference also reflected this trend.

Adan Sus  
Philosophy, Autonomous University of Barcelona

Daniele Molinini  
REHSEIS, Paris 7

## Artificial General Intelligence, 5–8 March

During March 5–8, 2010, around 75 researchers from various disciplines converged at the University of Lugano for the Third Conference on Artificial General Intelligence (AGI-10).

AGI-10 was the first European AGI conference, and continued the mission of the first two AGI conferences held in the USA: gathering an international group of leading academic and industry researchers involved in serious scientific and engineering work aimed directly toward the goal of creating AI systems with general intelligence at the human level and ultimately beyond.

A survey of researchers at the AGI-09 conference, published in [H+ Magazine](#), showed that a significant plurality of AGI researchers are betting human-level AGI will come within a few decades. As AGI conference series chair Ben Goertzel notes, “This may sound science-fictional, but bear in mind that Skype, Wikipedia, YouTube, or Google Earth on the iPhone would have sounded pretty farfetched just two or three decades ago. Though much work still remains, advances in computer hardware, cognitive science, neuroscience and computer science are making advanced AI seem more feasible than it did even a decade ago”.

Sponsored by AAAI, KurzweilAI.net, and the Università della Svizzera Italiana, the conference included contributed talks and posters and invited tutorials, keynote presentations by reinforcement-learning luminary Richard Sutton and whole-brain-emulation pioneer Randal Koene, and the awarding of the 2010 Kurzweil Prizes.

The Kurzweil Prize for Best AGI Paper went to “Frontier Search” by Lugano researchers Yi Sun, Tobias Glasmachers, Tom Schaul and Juergen Schmidhuber, which presents a novel formal framework unifying earlier, Solomonoff-induction inspired approaches to rigorous AGI such as Levin search and the speed prior.

On the more pragmatic side, the Kurzweil Prize for Best AGI Idea was awarded to “The Toy Box Problem (and a Preliminary Solution)” by Australian PhD student Benjamin Johnston. Johnston’s Comirit architecture combines inference and emulation in an intimate way, thus embodying the integrative design principle that is thought by many AGI researchers to be one of the keys to achieving practical AGI. The paper also describes a real-world test problem, the Toy Box

problem (involving flexibly utilizing a variety of toys in a preschool-type toy box), which serves as a natural ground for describing and testing Comirit and other AGI architectures.

The dichotomy between these two prize-winning papers illustrates one of the key threads of discussion that ran through the conference. On the one hand, a number of researchers presented abstract mathematical approaches to AGI (the conference by the Sun et al paper, Marcus Hutter's tutorial and others). On the other hand, the more pragmatic system-building approach to AGI was also well-represented—e.g. by Johnston, SOAR pioneer John Laird, Ben Goertzel, and others. While these two approaches are ultimately aimed at the same goal, the relation between them is not always clear. One idea that surfaced in several presentations and discussions was that the architectural principles underlying pragmatic AGI systems seem to reflect adaptation to properties of real-world environments, which are not yet captured in the formal models used by those pursuing rigorous AGI.

While the community of AGI researchers is nowhere near a consensus on the best approach to the original, grand goal of the AI field, it's clear that the pursuit of the goal is alive and well, and yielding interesting discoveries and discussions.

**Ben Goertzel**  
AGI Steering Committee Chair

**Marcus Hutter**  
AGI'10 Conference Chair

## Multi-Level Causation, 25–26 March

On 25–26 March a successful workshop on 'Multi-Level Causation' was held at the IHPST in Paris within the context of the ANR/DFG project 'Causality and Probability' (CAUSAPROBA) - a joint undertaking between the IHPST and the University of Konstanz. The workshop brought together a group of researchers from across Europe and North America.

One of the most interesting things to come out of the workshop was a clarification of at least two important respects in which causation might be thought level-relative. A first respect concerns the distinction between causation at the generic and single-case levels. Federica Russo (Kent) argued that that this distinction is important and that different types of evidence are appropriate to informing us about causation at each of these levels. By contrast, Antony Eagle (Oxford) drew upon linguistic evidence to argue that there is in fact no *sui generis* generic causation.

A second respect in which causation might be thought level-relative concerns the notion that reality

has various grains, with physics providing the most fine-grained picture and the special sciences furnishing more coarse-grained views. There is then an important question concerning how the properties, laws, and causal relations posited by the various special sciences relate to one another and to those of fundamental physics. This issue occupied the majority of our speakers, with case studies being made of a range of high-level sciences, including biology, sociology, ecology, and statistical mechanics.

Several interesting themes and debates emerged. Eric Raidl (IHPST) provided reasons for doubting that statistical mechanics can sustain causal explanations, whilst Alastair Wilson (Oxford) and Luke Glynn (Konstanz) argued to the contrary. Among those who endorsed genuine high-level causation, Alyssa Ney (Rochester) argued that high-level causation supervenes on physical causal relations, whilst Gregory Mikkelsen (McGill) and others argued that high-level causation is at least somewhat autonomous. Most participants nevertheless supposed there to be a close explanatory connection between the levels, and Arnaud Banos (CNRS) explored this connection by appeal to the notion of reproducibility. Most participants also assumed (perhaps contra Russell) that some sense can be made of physical causation, and Arnaud Pocheville and Mal Montvil (Paris V) argued that physical causation can indeed be understood in terms of an epistemic, symmetry-breaking relation.

Finally, many participants supposed a close connection between causality and chance, arguing that high-level sciences furnish causality-grounding chances. Yet Marcel Weber (Konstanz) argued that stochastic models provide no better an account of the behaviour of certain biological systems than deterministic models, raising the concern that the chances needed by probabilistic accounts of high-level causal explanation may simply be lacking. Carl Hoefer (Universitat Autònoma de Barcelona) agreed that there may be too few chances for a probabilistic analysis to succeed, but argued that objective chance-raising is no part of the correct understanding of causation.

The focus of the CAUSAPROBA project now shifts to Konstanz, where the next workshop (on a second project theme of 'Actual Causation') will be held on 23–24 September, with another exciting speaker line-up including Helen Beebee (Birmingham), David Danks (CMU), Isabelle Drouet (Louvain), Ned Hall (Harvard), Jens Harbecke (Witten/Herdecke), Max Kistler (UPMF), and L. A. Paul (UNC Chapel Hill).

**Luke Glynn**  
Philosophy, Universität Konstanz

## Calls for Papers

**THE METHODS OF APPLIED PHILOSOPHY:** special issue of the *Journal of Applied Philosophy*, deadline 1 April.

**ADVANCES AND PERSPECTIVES IN THE MECHANIZATION OF MATHEMATICS:** special issue of *Mathematical Structures in Computer Science*, deadline 28 June.

**FINAL CAUSES AND TELEOLOGICAL EXPLANATIONS:** special issue of *Logical Analysis and History of Philosophy*, deadline 30th June.

**BIOLOGICAL AND ECONOMIC MODELLING:** special issue of *Biology and Philosophy*, deadline 31 August.

**LOGIC AND NATURAL LANGUAGE:** special issue of *Studia Logica*, deadline 3 September.

**THE EXTENDED MIND:** special issue of *Teorema*, deadline 1 October.

**PHILOSOPHICAL HISTORY OF SCIENCE:** special issue of *The Monist*, deadline 31 October.

**EXPERIMENTAL PHILOSOPHY:** special issue of *The Monist*, deadline 30 April 2011.

**FORMAL AND INTENTIONAL SEMANTICS:** special issue of *The Monist*, deadline 30 April 2012.

## §4 WHAT'S HOT IN ...

We are looking for columnists willing to write pieces of 100-1000 words on what's hot in particular areas of research related to reasoning, inference or method, broadly construed (e.g., Bayesian statistical inference, legal reasoning, scientific methodology). Columns should alert readers to one or two topics in the particular area that are hot that month (featuring in blog discussion, new publications, conferences etc.). If you wish to write a "What's hot in ...?" column, either on a monthly or a one-off basis, just send an email to [features@thereasoner.org](mailto:features@thereasoner.org) with a sample first column.

## ... Logic and Rational Interaction

Multimedia has been the theme of the last weeks on **Logic and Rational Interaction**. We published one [audio interview with Cristina Bicchieri](#), on epistemic game theory, social norms, the role of experiment and conditional preferences. We also posted two workshop reports in the form of audio interviews with their organizers: one [interview with R. Ramanujam and Rineke Verbrugge](#) on the workshop Formal Theories of Communication, held in Leiden on Feb. 22nd to 26th, and one [interview with Jonathan Zvesper](#) on the workshop Believing in Games, held in Amsterdam on March 8th.

Written workshop reports remain our firm basis, though, and we were happy to post a good number of them in the last period. Zhaoqing Xu wrote on the [3rd](#)

[Indian School on Logic and its Applications](#); Sebastian Sequoia-Grayson reported the [activities at the Formal Epistemology Project at the University of Leuven](#); Davide Grossi wrote on the workshop [Formal Model of Norm Change](#); and Giacomo Sillari reported on the workshop [Epistemology, Context and Formalism](#), held in Nancy.

We finally announced a number of new publications and working papers: a new master thesis at the ILLC (Amsterdam), [A Momentary Lapse Of Reason](#), by Olga Grigoriadou; a paper on [Tableaux for Public Announcement Logic](#) by Philippe Balbiani, Hans van Ditmarsch and Andreas Herzig; two new working papers from the [Computational Social Choice Group in Amsterdam](#); and finally an interesting mixture of philosophy of mathematics and empirical research, [Peer review and knowledge by testimony in mathematics](#), by Christian Geist, Benedikt Löwe and Bart Van Kerkhove.

It is now time for our usual open invitation to contribute **Logic and Rational Interaction**. This time, however, is a good occasion to remind you that we not only welcome contributions on any *theme* relevant to our website, but also in any *format* that the wonderful possibilities of the Internet affords! So, if you are attending a conference or meeting interesting people and happen to have an voice recorder or even a video camera with you, please don't hesitate: take a few minutes and do a short interview for **Logic and Rational Interaction**. For more information about how to post on our website, or to submit contributions, please contact our web manager, [Rasmus Rendvig](#).

Olivier Roy  
Philosophy, Groningen

## ... Formal Epistemology

Johan van Benthem spoke to the biggest crowd for FSP this academic year on two frameworks for dynamifying a logic. One way that we might do this is as follows: We start with some kind of logic of the classical connectives, and we then add dynamic operations to this logic. These operations might be things such as "while-do", or "if-then-else" or some such. Others might be operators that denote public announcements and so on. The thing that all such approaches have in common is that they are constructed along the lines of a modal logic such as S4—the dynamic operators are attached to a logic that is largely classical. By contrast, we might revisit the logical operators themselves, and imbue them with dynamic properties. In this case, we are not extending logics with formulas constructed out of classical connectives with additional dynamic operations, but "putting the dynamics inside", so to speak. Here, the connectives themselves get dynamified. After

laying out the differences between the two approaches, and giving a categorisation of various dynamic logics in light of this taxonomy, van Benthem explored the potential for research projects in both frameworks to deliver results. Here is what I think is one interesting avenue for interaction between the two. Take a logic of public announcements, as captured by dynamic epistemic logic, as a canonical example of dynamification in the first sense. As things stand, the internal processing of the announcements by the agents composing the networks is left as a black-box-process. The inputs-outputs are specified, without exploring the processing dynamics internal to the agents themselves. In order to begin this exploration, we might find that we need to add dynamic operations in the second sense, by dynamifying the operations themselves ...

In a model he developed with Ulrich Krause, Rainer Hegselmann demonstrated how a number of truth-seeking agents repeatedly update their beliefs partly on the basis of the beliefs of certain other agents. This model has been studied extensively with the help of computer simulations. It is a known limitation of this model that each agent is supposed to be aware at all times of the beliefs of all other agents; at least this is a limitation if the model should serve as a model of collaboration among groups of actual people. In his talk, Rainer presented a new model, or actually a whole new simulation environment—which he dubbed ENSIM, for Epistemic Network Simulator—that overcomes the said limitation. In this model, agents can form networks on the basis of various properties and interact only with those agents in their network. In particular, it is no longer assumed that each agent is aware of all the other agents' beliefs; it is only aware of the beliefs of those agents who are in its network. Rainer showed impressive results from simulations carried out in this new model.

Photos of our fun may be found [here](#).

The full FPS programme is available [here](#).

[Sebastian Sequoia-Grayson](#)  
Formal Epistemology Project, University of Leuven

### ... Game Theoretic Reasoning

The 24th European Conference on Operational Research, [EURO 2010](#) will be held from 11-14 July 2010 in Lisbon. The conference comprises of an impressive list of speakers. Interestingly, both the plenary speakers are game theorists: Harold Kuhn and John Nash. Other star invited speakers related to game theory include Noga Alon and Stef Tijs. If the conference is anywhere like the previous one, there will be many presentation sessions on game theoretic reasoning.

The [Gale-Shapley algorithm](#) is a popular example of the use of elegant game theory to solve an important real world problem. The algorithm led to tremendous growth in the field of matching theory and market design. Alvin Roth, who is a well known game theorist, maintains a webpage [Al Roth's Game Theory, Experimental Economics, and Market Design Page](#) with a comprehensive list of pointers concerning game theory and market design. There is also an accompanying [blog](#) which tracks incentives and market phenomena in everyday life.

On the topic of matching theory, the [next edition](#) of the Coalition Theory Network (CTN) Workshop will take place in Marseille, June 17-18, 2010. This workshop will present the state of the art of coalition/network formation and matching theory. The Coalition Theory Network also maintains a [series](#) of working papers in related topics. Interestingly, fundamental research in coalition formation and matching theory is also of interest to the [artificial intelligence community](#).

The website for the 3rd International Symposium on Algorithmic Game Theory (SAGT) is [now up](#). The symposium is focused on a computational perspective on game theory. The venue is Athens and the dates are 18-20 September 2010. For more on algorithmic game theory, [Noam Nisan](#) maintains a blog <http://agtb.wordpress.com/> with regular entries.

A COST-ADT Doctoral School on Computational Social Choice will be organized in Estoril, Lisbon from 9 -14 April 2010. The school is generally aimed at PhD students interested in the intersection of social choice theory and computer science. [Here](#) is a quick overview of the new field of computational social choice.

Haris Aziz  
Informatics, Ludwig-Maximilians-University Munich

## §5 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 have feedback concerning any of the items printed here, please email [features@thereasoner.org](mailto:features@thereasoner.org) with your comments.

### Deduction

Deduction can be characterised as necessary inference. It is widely, though not universally, accepted that deduction is a transition from (at least one) premise(s) to a conclusion, such that it is impossible for the former to be (jointly) true and the conclusion false. Note that

false premisses can lead in a deductively valid way to a true conclusion—e.g., Napoleon was Indian; All Indians are conquerors, so Napoleon was a conqueror—constituting an unsound argument. Validity of deductive arguments is widely taken to depend exclusively on logical relations between sentences, rather than substantive relations between the contents they express. Importantly, the content of the conclusion of a deductively valid argument is uninformative relative to the content of the premise-set. In a deductive argument, one cannot (i) increase the (informational) content of the conclusion above that of the premise-set; nor (ii) decrease said content by adding more restrictive premisses: If  $A$  implies  $B$ , then  $A \wedge C$  still implies  $B$  (monotony); nor (iii) order premisses according to their contents' importance: Should premisses believed to be true deductively imply a false conclusion, then—logically—each premise is equally revisable; nor (iv) validate premisses by means of a true conclusion which is deductively implied.

Frank Zanker

Philosophy and Cognitive Science, Lund University

## Megarians

The Megarian School was founded in Athens by Euclides of Megara (c.435–c.365) in the first half of the fourth century BC. Euclides, a student of Socrates, combined Parmenides' notions of oneness and immutability with Socrates' idea of true knowledge. The sensible world of perceptions is said to be an illusion, so that the essential natures of things are “bodiless forms”. Euclides defends the unity of goodness: while the highest good accounts for the highest reality, the opposite of goodness has no existence. Eubulides of Miletus, successor of Euclides, criticised Aristotle's concepts of motion and potentiality, which endanger the unity of goodness. Indeed, change contradicts immutability; and potentiality conflicts with oneness, in so far as not all potentialities are actualised. The fact that not all possibilities are realised allows a multiplicity of opposites to be possible.

Diodorus Cronus, who had some influence on Stoic logic, assumed that what is possible about the past is necessarily realised in the present or future. He defined the so called Master Argument, based on the three following assertions:

- (1) Everything true about the past is true in the present.
- (2) The impossible does not follow from the possible.
- (3) Something that is possible may never be true (i.e. may never be realised).

The third proposition is said to be false, and is thereby inconsistent with the two other true assertions. Diodorus defended the view that all possibilities are realisable in the present or future, meaning that whatever is possible is actual at some time. Thus, what is possible either is, or will be, true. By contrast, Philo of Megara, student of Diodorus, held the view that not all possibilities are realisable, as he supposed that the future does not contain the realisations of all possibilities. What is possible may not be actual at some future time; that is, not all possible events will be actualised. In that case, what is possible may be false. Nevertheless, Philo of Megara, student of Diodorus, restricted the truth of a conditional to the present, such that a conditional proposition may be either true or false in the future. Accordingly, not all conditional propositions are true, since not all possibilities are realisable in the future.

The Megarians were the first to coin the Liar paradox, namely: If we say that we are lying, are we telling the truth or are we lying? They also adopt the *eristic* method, which aims to win arguments, contrary to Socrates' *heuristic* method whose purpose is to discover truths in reality. Eristic is often associated with *sophistic* in relation to arguments that systematically refute everything incompatible with the defended doctrine.

Jean-Louis Hudry

Philosophy, University of Tartu

## §6 EVENTS

### APRIL

**THEORY OF BELIEF FUNCTIONS:** Brest, France, 1–2 April.

**THE SNOWBIRD WORKSHOP:** The Learning Workshop, Cliff Lodge, Snowbird, Utah, 6–9 April.

**JAIST:** International Symposium on Integrated Uncertainty Management and Applications, Ishikawa, Japan, 9–11 April.

**NEWTON AND EMPIRICISM:** Center for Philosophy of Science, University of Pittsburgh, 10–11 April.

**WHERE'S YOUR ARGUMENT?**: Informal Logic, Critical Thinking and Argumentation, Manchester Metropolitan University, Cheshire UK, 12–13 April.

**ADS:** Agent-Directed Simulation Symposium, Orlando, Florida, USA, 12–15 April.

**RSC:** 33rd Research Students' Conference in Probability and Statistics, Department fo Statistics, University of Warwick, 12–15 April.

**SCIENTIFIC PHILOSOPHY: PAST AND FUTURE:** Tilburg University, The Netherlands, 13 April.

**PROGRESS IN MEDICINE:** University of Bristol, 13–15 April.

**VISIONS OF COMPUTER SCIENCE:** Edinburgh University, 13–16 April.

**BEYOND THEORETICAL RATIONALITY. CARNAP FACES KUHN AND QUINE:** IHPST, Paris, 14 April.

**THE FUTURE OF PHILOSOPHY OF SCIENCE:** Tilburg Center for Logic and Philosophy of Science, 14–16 April.

**SYNTHESE CONFERENCE:** Columbia University, New York, 15–16 April.

**SSPP:** Southern Society for Philosophy and Psychology annual meeting, Atlanta, GA, 15–17 April.

**NORTHWESTERN/NOTRE DAME EPISTEMOLOGY CONFERENCE:** Northwestern University, 16 April.

**UNILOG:** 3rd World Congress and School on Universal Logic, Lisbon, Portugal, 18–25 April.

**FLOPS:** 10th International Symposium on Functional and Logic Programming, Sendai, Japan, 19–21 April.

**FORMAL ETHICS WEEK:** University of Groningen, 20–23 April.

**NON-CLASSICAL MATHEMATICS:** a special session at World Congress on Universal Logic 2010, Lisbon, Portugal, 22–25 April.

**FORMAL SEMANTICS AND PRAGMATICS:** 6th International Symposium of Cognition, Logic and Communication, University of Latvia, Riga, 23–25 April.

**INSTRUMENTS: MENTAL AND MATERIAL:** 6th Annual HAPSAT Conference, Institute for the History and Philosophy of Science and Technology, University of Toronto, 25 April.

**LPAR:** 16th International Conference on Logic for Programming, Artificial Intelligence and Reasoning, Dakar, Senegal, 25 April - 1 May.

**ICCMNC:** International Conference on Computer Mathematics and Natural Computing, Rome, Italy, 28–30 April.

**RAIO:** Adaptivity, Personalization and Fusion of Heterogeneous Information, Paris, France, 28–30 April.

**SDM:** SIAM Conference on Data Mining, Columbus, Ohio, 29 April–1 May.

**IGCC:** 2nd annual Interdisciplinary Graduate Conference on Consciousness, Boston University, 30 April–1 May.

**REFERENCE AND REFERRING:** Inland Northwest Philosophy Conference, Moscow, ID & Pullman, WA, 30 April–2 May.

**MAY**

**GRADUATE STUDENT LOGIC CONFERENCE:** CUNY Graduate Center, New York, USA, 7–8 May.

**VAGUENESS AND SIMILARITY:** Ecole Normale Supérieure, Paris, 7–8 May.

**MODELS AND SIMULATIONS:** University of Toronto, 7–9 May.

**REASON TODAY. FROM DIFFERENTIATION TO UNITY:** Babes-Bolyai University, Cluj-Napoca, Romania, 7–9 May.

**KR:** 12th International Conference on the Principles of Knowledge Representation and Reasoning, Toronto, Canada, 9–13 May.

**AAMAS:** 9th International Conference on Agents and Multi Agent Systems, Toronto, Canada, 10–14 May.

**FORMAL EPISTEMOLOGY FESTIVAL:** Learning From Experience & Defeasible Reasoning, University of Toronto, 11–13 May.

**FOIS:** Toronto, Canada, 11–14 May.

**AISTATS:** 13th International Conference on Artificial Intelligence and Statistics, Chia Laguna, Sardinia, Italy, 13–15 May.

**LOGIC IN COGNITIVE SCIENCE:** Torun, Poland, 13–15 May.

**THE MENTAL AS FUNDAMENTAL. PANPSYCHISM AND THE HARD PROBLEM OF CONSCIOUSNESS:** Departement of Philosophy, University of Vienna, 14 May.

**DEGREES OF BELIEF VS BELIEF:** University of Stirling, 14–15 May.

**PSF:** Philosophy of Science in a Forest, Internationale School voor Wijsbegeerte (ISvW), The Netherlands, 14–15 May.

**NMR:** Workshop on Commonsense and Non-Monotonic Reasoning for Ontologies, Sutton Place, Toronto, Canada, 14–16 May.

**CASI:** Conference of Applied Statistics in Ireland, Portrush, 16–18 May.

**AUTOMATED KNOWLEDGE BASE CONSTRUCTION:** Grenoble, France, 17–19 May.

**MEANING, MODALITY AND APRIORITY:** University of Cologne, Germany, 17–20 May.

**INFINITY:** Infinite and Infinitesimal in Mathematics, Computing, and Natural Sciences, Cetraro, Italy, 17–21 May.

**FLAIRS:** 23rd Florida Artificial Intelligence Research Society Conference, Daytona Beach, Florida, 19–21 May.

**IDA:** 9th International Symposium on Intelligent Data Analysis, Tucson, Arizona, 19–21 May.

**POBAM:** Philosophy of Biology @ Madison Workshop, University of Wisconsin-Madison, 21–23 May.

**PM@100: LOGIC FROM 1910 TO 1927:** Bertrand Russell Research Centre, McMaster University, Hamilton, Ontario, Canada, 21–24 May.

**SLACRR:** 1st St. Louis Annual Conference on Reasons and Rationality, University of Missouri-St. Louis, 23–25 May.

**ALGORITHMIC RANDOMNESS:** Department of Mathematics, University of Notre Dame, 24–28 May.

**LATA:** 4th International Conference on Language and Automata Theory and Applications, Trier, Germany, 24–28 May.

**ISMVL:** 40th International Symposium on Multiple-Valued Logic, Barcelona, Spain, 26–28 May.

**BENELEARN:** 19th Annual Machine Learning Conference of Belgium and The Netherlands, Katholieke Universiteit Leuven, Belgium, 27–28 May.

**SPE3:** Semantics and Philosophy in Europe, Institut d'Histoire et de Philosophie des Sciences et des Techniques (IHPST) and Ecole Normale Supérieure (ENS), Paris, 27–29 May.

**PHILOSOPHY AND MATHEMATICS:** A memorial conference in honour of Professor John J. Cleary, Trinity College Dublin, 28–29 May.

**MODEL UNCERTAINTY:** Centre for Research in Statistical Methodology (CRiSM), Warwick, 30 May - 1 June.

**BSAP:** First meeting of the Brazilian Society for Analytic Philosophy, Unisinos University, Brazil, 31 May–2 June.

## JUNE

**PHILOSOPHY AND MODEL THEORY:** History and Contemporary Developments, Philosophical Issues and Applications, Paris, 2–5 June.

**BLAST:** Boolean Algebras, Lattices, Algebra, Set Theory, and Topology, Boulder, Colorado, 2–6 June.

**COGNITIVE ECOLOGY: THE ROLE OF THE CONCEPT OF KNOWLEDGE IN OUR SOCIAL COGNITIVE ECOLOGY:** Episteme Conference, University of Edinburgh, 3–4 June.

**VALENCIA INTERNATIONAL MEETINGS ON BAYESIAN STATISTICS:** Benidorm, Spain, 3–8 June.

**ICIC:** 3rd International Conference on Information and Computing Science, Jiangnan University, Wuxi, China, 4–6 June.

**ICMS:** 3rd International Conference on Modelling and Simulation, Jiangnan University, Wuxi, China, 4–6 June.

**IIS:** Intelligent Information Systems, Siedlce, Poland, 8–10 June.

**DGL:** 4th Workshop in Decisions, Games & Logic, Paris, France, 9–11 June.

**SOCIETY FOR PHILOSOPHY AND PSYCHOLOGY:** 36th Annual Meeting, Lewis & Clark College, Portland, Oregon, 9–12 June.

**ICCSS:** IEEE International Conference on Computational and Statistical Science, Manila, Philippines, 11–13 June.

**ICDDM:** IEEE International Conference on Database and Data Mining, Manila, Philippines, 11–13 June.

**FOUNDATIONS OF LOGICAL CONSEQUENCE:** Arché Research Centre, The University of St Andrews, 11–15 June.

**WHAT'S TRUTH GOT TO DO WITH IT?:** University of East Anglia, 12 June.

**ICAISC:** 10th International Conference on Artificial Intelligence and Soft Computing, Zakopane, Poland, 13–17 June.

**DM:** SIAM Conference on Discrete Mathematics, Hyatt Regency Austin, Austin, Texas, 14–17 June.

**ADJECTIVES AND RELATIVE CLAUSES: SYNTAX AND SEMANTICS:** Venice, 16–17 June.

**OBJECTIVITY IN SCIENCE:** University of British Columbia, 17–20 June.

**SQUARE OF OPPOSITION:** Corte, Corsica, 17–20 June.

**PCC:** 9th Proof, Computation and Complexity, Bern, Switzerland, 18–19 June.

**FROM PRACTICE TO RESULTS IN LOGIC AND MATHEMATICS:** Nancy, France, 21–23 June.

**LCM:** 4th International Conference on Language, Culture and Mind, Turku, Finland, 21–23 June.

**MPC:** 10th International Conference on Mathematics of Program Construction, Québec City, Canada, 21–23 June.

**PAKDD:** 14th Pacific-Asia Conference on Knowledge Discovery and Data Mining, Hyderabad, India, 21–24 June.

**CCA:** 7th International Conference on Computability and Complexity in Analysis, Zhenjiang, China, 21–25 June.

**ICML:** 27th International Conference on Machine Learning, Haifa, Israel, 21–25 June.

**LOGICA:** Hejnice, northern Bohemia, 21–25 June.

**HUMAN-ROBOT PERSONAL RELATIONSHIPS:** Leiden University, The Netherlands, 23–24 June.

**HOPOS:** International Society for the History of Philosophy of Science, Central European University, Budapest, Hungary, 24–27 June.

**MIND, SCIENCE AND EVERYTHING!:** University of Glasgow, 25–26 June.

**POP III:** 3rd Graduate Conference in Philosophy of Probability, Centre for Philosophy of Natural and Social Science, London School of Economics, 25–26 June.

**ILP:** 20th International Conference on Inductive Logic Programming, Firenze, Italy, 27–30 June.

**WORK IN PROGRESS IN CAUSAL AND PROBABILISTIC REASONING:** University of Kent, Paris Campus, 28–29 June.

**IPMU:** 13th International Conference on Information Processing and Management of Uncertainty in Knowledge-Based Systems, Dortmund, Germany, 28 June - 2 July.

**CiE:** Computability in Europe: Programs, Proofs, Processes, Ponta Delgada (Azores), Portugal, 30 June - 4 July.

## JULY

**AAL:** Australasian Association for Logic Conference, Sydney, Australia, 2–4 July.

**METHODS OF APPLIED PHILOSOPHY:** St Anne's College, Oxford, 2–4 July.

**MAXENT:** 30th International Workshop on Bayesian Inference and Maximun Entropy Methods in Science and Engineering, Chamonix, France, 4–9 July.

**AISC:** 10th International Conference on Artificial Intelligence and Symbolic Computation, CNAM, Paris, France, 5–6 July.

**LOFT:** 9th Conference on Logic and the Foundations of Game and Decision Theory, University of Toulouse, France, 5–7 July.

**IWAP:** 5th International Workshop on Applied Probability, Universidad Carlos III de Madrid, Colmenarejo, Madrid, Spain, 5–8 July.

**IWSM:** 25th International Workshop on Statistical Modelling, Department of Statistics, University of Glasgow, 5–9 July.

**CONFERENCES ON INTELLIGENT COMPUTER MATHEMATICS:** Paris, France, 5–10 July.

**INC:** 8th International Network Conference, Heidelberg, Germany, 6–8 July 2010.

**WoLLIC:** 17th Workshop on Logic, Language, Information and Computation, Brasília, Brazil, 6–9 July.

**DEON:** 10th International Conference on Deontic Logic in Computer Science, Florence, 7–9 July.

**ISPDC:** 9th International Symposium on Parallel and Distributed Computing, Istanbul, Turkey, 7–9 July.

**IPTA:** International Conference on Image Processing Theory, Tools & Applications, Paris, France, 7–10 July.

**BSPS:** British Society for the Philosophy of Science Annual Conference, University College, Dublin, 8–9 July.

**UAI:** 26th Conference on Uncertainty in Artificial Intelligence, Catalina Island, California, 8–11 July.

**ICCSIT:** 3rd IEEE International Conference on Computer Science and Information Technology, Chengdu, China, 9–11 July.

**FLoC:** 5th Federated Logic Conference, University of Edinburgh, 9–21 July.

**METAPHYSICS AND EPISTEMOLOGY IN CHINESE PHILOSOPHY:** School of Philosophy, Renmin University of China, Beijing, China, 10–11 July.

**LICS:** Logic in Computer Science, Edinburgh, Scotland, UK, 11–14 July.

**SCSC:** 2010 Summer Computer Simulation Conference, Ottawa, ON, Canada, 11–14 July.

**TMFCS:** International Conference on Theoretical and Mathematical Foundations of Computer Science, Orlando, FL, USA, 12–14 July.

**UNCERTAINTY IN COMPUTER MODELS:** Sheffield, UK, 12–14 July.

**WORLDCOMP:** World Congress in Computer Science, Computer Engineering, and Applied Computing, Las Vegas, Nevada, 12–15 July.

**CBR-MD:** International Workshop Case-Based Reasoning on Multimedia Data, Berlin, Germany, 14 July.

**BICS:** Brain-Inspired Cognitive Systems Conference, Madrid, Spain, 14–16 July.

**ICCBR:** 18th International Conference on Case-Based Reasoning, Alessandria, Italy, 19–22 July.

**WCCM/APCOM:** 9th World Congress on Computational Mechanics and 4th Asian Pacific Congress on Computational Mechanics, Sydney, Australia, 19–23 July.

**STRUCTURE AND IDENTITY:** University of Bristol, 23–25 July.

**NACAP:** Simulations and Their Philosophical Implications, Carnegie Mellon University, 24–26 July.

**KDD:** 16th ACM SIGKDD Conference on Knowledge Discovery and Data Mining, Washington, DC, 25–28 July.

**JULIAN JAYNES CONFERENCE ON CONSCIOUSNESS:** Charlottetown, Canada, 29 July.

**BWGT:** Brazilian Workshop of the Game Theory Society, University of São Paulo, 29 July–4 August.

**AUGUST**

**FLINS:** 9th International FLINS Conference on Foundations and Applications of Computational Intelligence, Chengdu (Emei), China, 2–4 August.

**THOUGHT IN SCIENCE AND FICTION:** 12th International Conference of the International Society for the Study of European Ideas, Ankara, 2–6 August.

**MSN-DS:** 2nd International Workshop on Mining Social Network for Decision Support, Odense, Denmark, 9–11 August.

**ICNC-FSKD:** the 6th International Conference on Natural Computation and the 7th International Conference on Fuzzy Systems and Knowledge Discovery, Yantai, China, 10–12 August.

**ICCP:** 10th International Conference on Philosophical Practice, Leusden, Netherlands, 11–14 August.

**MAKING DECISIONS:** Singapore Multidisciplinary Decision Science Symposium, Nanyang Technological University, Singapore, 12–13 August.

**CONFERENCE ON MATHEMATICAL LOGIC AND SET THEORY:** Chennai, India, 15–17 August.

**ARCOE:** Automated Reasoning about Context and Ontology Evolution, Lisbon, 16–17 August.

**ECAI:** 19th European Conference on Artificial Intelligence, Lisbon, Portugal, 16–20 August.

**EUROPEAN MEETING OF STATISTICIANS:** Department of Statistics and Insurance Science, University of Piraeus, Greece, 17–22 August.

**TRUTH MATTERS:** Toronto, 18–20 August.

**ARTIFICIAL LIFE:** 12th International Conference on the Synthesis and Simulation of Living Systems, Odense, Denmark, 19–23 August.

**COMPSTAT:** 19th International Conference on Computational Statistics, Paris, France, 22–27 August.

**CIPP:** Collective Intentionality VII, Perspectives on Social Ontology, University of Basel, Switzerland, 23–26 August.

**CSL:** Annual Conference of the European Association for Computer Science Logic, Brno, Czech Republic, 23–27 August.

**CONCEPT TYPES AND FRAMES:** in Language, Cognition, and Science, Düsseldorf, Germany, 24–26 August.

**ESPP:** Meeting of the European Society for Philosophy and Psychology, Bochum and Essen, Germany, 25–28 August.

**AiML**: 8th International Conference on Advances in Modal Logic, Moscow, 25–29 August.

**ASAI**: 11th Argentine Symposium on Artificial Intelligence, Ciudad Autónoma de Buenos Aires, 30 August - 3 September.

#### SEPTEMBER

**KSEM**: 4th International Conference on Knowledge Science, Engineering and Management, Belfast, Northern Ireland, UK, 1–3 September.

**FEW**: 7th Annual Formal Epistemology Workshop, Konstanz, 2–4 September.

**TIME**: 17th International Symposium on Temporal Representation and Reasoning, Paris, France, 6–8 September.

**PRINCIPLES AND METHODS OF STATISTICAL INFERENCE WITH INTERVAL PROBABILITY**: Durham, 6–10 September.

**CAUSATION AND DISEASE IN THE POSTGENOMIC ERA**: 1st European Advanced Seminar in the Philosophy of the Life Sciences, Geneva, Switzerland, 6–11 September.

**LOGIC, ALGEBRA AND TRUTH DEGREES**: Prague, Czech Republic, 7–11 September.

**PLURALISM IN THE FOUNDATIONS OF STATISTICS**: University of Kent, Canterbury, UK, 9–10 September.

**PGM**: 5th European Workshop on Probabilistic Graphical Models, Helsinki, Finland, 13–15 September.

**EPISTEMIC ASPECTS OF MANY-VALUED LOGICS**: Prague, 13–16 September.

**AS**: Applied Statistics, Ribno, Bled, Slovenia, 19–22 September.

**IVA**: 10th International Conference on Intelligent Virtual Agents, Philadelphia, Pennsylvania, USA, 20–22 September.

**LRR**: Logic, Reason and Rationality, Centre for Logic and Philosophy of Science, Ghent University, Belgium, 20–22 September.

**WORLD COMPUTER CONGRESS**: International Federation for Information Processing, Brisbane, Australia, 20–23 September.

**MATES**: 8th German Conference on Multi-Agent System Technologies, Karlsruhe, Germany, 21–23 September.

**TRUTH, KNOWLEDGE AND SCIENCE**: 9th National Conference of the Italian Society for Analytic Philosophy, University of Padua, 23–25 September.

**&HPS3**: Integrated History and Philosophy of Science, Indiana University, Bloomington, 23–26 September.

**LOGIC AND LANGUAGE CONFERENCE**: Northern Institute of Philosophy, University of Aberdeen, 24–26 September.

**SMPS**: 5th International Conference on Soft Methods in Probability and Statistics, Mieres (Asturias), Spain, 28 September - 1 October.

#### OCTOBER

**E-CAP**: 8th European Conference on Computing and Philosophy, Muenchen, Germany, 4–6 October.

**AIAI**: 6th IFIP International Conference on Artificial Intelligence. Applications & Innovations, Ayia Napa, Cyprus, 5–7 October.

**CALCULATION, INTUITION, AND A PRIORI KNOWLEDGE**: Tilburg University, The Netherlands, 5–8 October.

**CAUSALITY IN THE BIOMEDICAL AND SOCIAL SCIENCES**: Erasmus University Rotterdam, 6–8 October.

**LPAR**: 17th International Conference on Logic for Programming, Artificial Intelligence and Reasoning, Yogyakarta, Indonesia, 10–15 October.

**THE NATURE OF BELIEF**: The Ontology of Doxastic Attitudes, University of Southern Denmark, Odense, 18–19 October.

**FMCAD**: International Conference on Formal Methods in Computer-Aided Design, Lugano, Switzerland, 20–23 October.

**ADT**: 1st International Conference on Algorithmic Decision Theory, Venice, Italy, 21–23 October.

**WORKSHOP ON BAYESIAN ARGUMENTATION**: Department of Philosophy & Cognitive Science, Lund University, Sweden, 22–23 October.

**NONMon@30**: Thirty Years of Nonmonotonic Reasoning, Lexington, KY, USA, 22–25 October.

**IJCCI**: 2nd International Joint Conference on Computational Intelligence, Valencia, Spain, 24–26 October.

**ICTAI**: 22th International IEEE Conference on Tools with Artificial Intelligence, Arras, France, 27–29 October.

## §7

### COURSES AND PROGRAMMES

#### Courses

**COST-ADT**: Doctoral School on Computational Social Choice, Estoril, Portugal, 9–14 April.

**OPEN PROBLEMS IN THE PHILOSOPHY OF SCIENCES**: Cesena, 15–17 April.

**FORMAL EPISTEMOLOGY SCHOOL**: Northern Institute of Philosophy at the University of Aberdeen, 14–18 June.

**NASSLLI**: 4th North American Summer School in Logic, Language and Information, Bloomington, Indiana, 21–25 June.

**FIRST EUROPEAN SUMMER SCHOOL ON LIFE & COGNITION**: Donostia-San Sebastian, Basque Country, Spain, 22–26 June.

**MODEL THEORY**: LMS/EPSRC Short Course, University of Leeds, 18–23 July.

**AII**: Asian Initiative for Infinity, Graduate Summer School in Logic, National University of Singapore, 28 June - 23 July.

**ISSEO**: International Summer School in Social and Ecological Ontology, Castello Tesino and Cinte Tesino, Italy, 5–9 July.

**THE SCIENCE OF THE CONSCIOUS MIND**: Vienna, 5–16 July.

**UCLA LOGIC CENTER**: Undergraduate Summer School in Mathematical Logic, Los Angeles, USA, 5–23 July.

**NN**: Summer School on Neural Networks in Classification, Regression and Data Mining, Porto, Portugal, 12–16 July.

**ANALYTIC PRAGMATISM, SEMANTIC INFERENTIALISM, AND LOGICAL EXPRESSIVISM**: 2nd Graduate International Summer School in Cognitive Sciences and Semantics, University of Latvia, Riga, 19–29 July.

**MEANING, CONTEXT, INTENTION**: Central European University (CEU), Budapest, Hungary, 19–30 July.

**ESSLLI**: European Summer School in Logic, Language and Information, University of Copenhagen, Denmark, 9–20 August.

**SIPTA**: 4th school of the Society for Imprecise Probability: Theories and Applications, Durham, UK, 1–6 September.

## Programmes

**DOCTORAL PROGRAMME IN PHILOSOPHY**: Language, Mind and Practice, Department of Philosophy, University of Zurich, Switzerland.

**HPSM**: MA in the History and Philosophy of Science and Medicine, Durham University.

**MASTER PROGRAMME**: Philosophy of Science, Technology and Society, Enschede, the Netherlands.

**MA IN COGNITIVE SCIENCE**: School of Politics, International Studies and Philosophy, Queen's University Belfast.

**MA IN LOGIC AND THE PHILOSOPHY OF MATHEMATICS**: Department of Philosophy, University of Bristol.

**MA IN METAPHYSICS, LANGUAGE, AND MIND**: Department of Philosophy, University of Liverpool.

**MA IN MIND, BRAIN AND LEARNING**: Westminster Institute of Education, Oxford Brookes University.

**MA IN PHILOSOPHY**: by research, Tilburg University.

**MA IN PHILOSOPHY OF BIOLOGICAL AND COGNITIVE SCIENCES**: Department of Philosophy, University of Bristol.

**MA IN RHETORIC**: School of Journalism, Media and Communication, University of Central Lancashire.

**MA PROGRAMMES**: in Philosophy of Language and Linguistics, and Philosophy of Mind and Psychology, University of Birmingham.

**MSc IN MATHEMATICAL LOGIC AND THE THEORY OF COMPUTATION**: Mathematics, University of Manchester.

**MSc IN ARTIFICIAL INTELLIGENCE**: Faculty of Engineering, University of Leeds.

## MA IN REASONING

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

**MSc IN COGNITIVE & DECISION SCIENCES**: Psychology, University College London.

**MSc in COGNITIVE SCIENCE**: University of Osnabrück, Germany.

**MSc in PHILOSOPHY OF SCIENCE, TECHNOLOGY AND SOCIETY**: University of Twente, The Netherlands.

**MASTER OF SCIENCE**: Logic, Amsterdam.

## §8

## JOBS AND STUDENTSHIPS

### Jobs

**ONE-YEAR FELLOWSHIP**: in Philosophy, City College of New York (CUNY), deadline 6 April.

**LECTURESHIP**: in Philosophy of Science, Department of Science and Technology Studies, UCL, deadline 16 April.

**PROFESSORSHIP**: in Philosophy of Science, University of Geneva, deadline 23 April.

**POST-DOC POSITION**: in the VIDI Project “Reasoning about quantum interaction: Logical modelling and verification of multi-agent quantum protocols”, University of Groningen, deadline 7 June.

**RESEARCH AND TEACHING POSITION**: in Philosophy of Science, UNAM, Mexico City, deadline 6 August.

### Studentships

**PhD POSITION**: in “Imprecise Probabilities for Reasoning With Risk”, University College Cork, deadline 4 April.

**PhD STUDENTSHIP**: “A Constraint Solver Synthesiser”, School of Computer Science, University of St Andrews, deadline 11 April.

**PhD POSITION**: in the project “Dynamics of Argumentation”, Computer Science, University of Luxembourg, deadline 15 April.

**PhD POSITION**: in Philosophy of Science, Department of Philosophy and Tilburg Center for Logic and Philosophy of Science, Tilburg University, deadline 15 April.

**Two PhD STUDENTSHIPS**: part of the Swiss National Science Foundation Sinergia project “Intentionality as the Mark of the Mental - Metaphysical Perspectives on Contemporary Philosophy of Mind”, Department of Philosophy, University of Geneva, deadline 18 April.

**TWO PHD STUDENTSHIPS:** “Essentialism and the Mind”, Department of Philosophy, University of Geneva, 18 April.

**TWO PHD POSITIONS:** in the VIDI Project “Reasoning about quantum interaction: Logical modelling and verification of multi-agent quantum protocols”, University of Groningen, deadline 7 June.

**JACOBSEN FELLOWSHIPS AND ROYAL INSTITUTE OF PHILOSOPHY BURSARIES:** for the academic year 2010–2011, deadline 11 June.

**BSPS DOCTORAL SCHOLARSHIP:** in Philosophy of Science, deadline 1 August.