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§1 Editorial

I am delighted to return as guest editor of *The Reasoner*. Exactly one year ago, I opened the September issue with an interview with Theo Kuipers from the University of Groningen. In our conversation, we touched upon a number of topics, in particular scientific realism, progress, truth, verisimilitude, and the method of philosophy of science. Nearly the same topics are the central ones of this month's interview. This is due not only to my lack of imagination, but also to the fact that, in my view, these are some of the most important problems in the philosophy of science. For this reason, I decided to ask Professor Ilkka Niiniluoto for an interview. During the last forty years, Niiniluoto has published an impressive number of papers on virtually all fields of contemporary philosophy of science, focussing particularly on probability and inductive logic, truth and verisimilitude (also known as truthlikeness or truth approximation), realism and scientific progress, and the evaluation of theories within natural and social sciences. Let me briefly survey his main contributions, which explain why he is the right person to answer my questions.

Niiniluoto is presently Chancellor of the University of Helsinki, where he teaches Theoretical Philosophy, and Chairman of the Philosophical Society of Finland. He is one of the most prominent figures of the philosophical school going back to Eino Kaila, Georg H. von Wright, and Jaakko Hintikka. The development of this tradition has been recently analyzed in a volume, Analytic Philosophy in Finland (Rodopi, 2003), edited by Niiniluoto himself (together with Leila Haaparanta), for which Niiniluoto wrote also the introductory, historical chapter. Within this tradition, the Finnish School of inductive logic takes the lion's share. Niiniluoto's first important contribution to the School's research programme is *Theoretical Concepts and Hypothetico-Inductive Inference* (Reidel, 1973), written together with Raimo Tuomela, in which the authors use Hintikka's inductive logic in order to defend critical scientific realism. A few years later, Niiniluoto and Tuomela also edited *The Logic and Epistemology*

of Scientific Change (Acta Philosophica Fennica, 30, 1979), a collection of papers devoted to four very recent (at that time) methodological research programmes: structuralism, cognitive decision theory, verisimilitude, and the logical theory of belief change.

Sometimes, errors do trigger progress in the history of ideas. It is well-known that Popper's attempt (in *Conjectures and Refutations*, 1963) to explicate the notion of verisimilitude (construed as similarity or closeness to the comprehensive truth about a target domain) was technically flawed, as Pavel Tichý and David Miller independently proved in 1974. This failure opened the way to the post-Popperian theories of verisimilitude, which constitute a lively research programme in formal philosophy of science. The most developed and well-known theory of verisimilitude is the so-called "similarity approach", proposed since 1974 by Pavel Tichý and Risto Hilpinen, and subsequently developed by Niiniluoto, Tuomela and Graham Oddie. About a decade later, Niiniluoto published two books: *Is Science Progressive?* (Reidel, 1984), a collection of essays devoted to explicating scientific progress in terms of increasing verisimilitude, and *Truthlikeness* (Reidel, 1987), a presentation of his own theory of verisimilitude, as well as a detailed discussion of the history, importance, and applicability of this notion, and a defence against its critics. *Truthlikeness* is often referred to as "the Bible of verisimilitude", since it contains virtually all you need to know for seriously studying the subject (in this case, you will also find useful Niiniluoto's survey article on "Verisimilitude: The third period" in the *British Journal for Philosophy of Science*, 49, 1998).

In his most recent book on these themes, *Critical Scientific Realism* (Oxford University Press, 1999), Niiniluoto offers a detailed and up-to-date presentation of his philosophical outlook. The book subtly combines a coherently fallibilist view of human knowledge with an uncompromising defence of realism in ontology, semantics, epistemology, theory construction, and methodology. Niiniluoto carefully distinguishes all the main forms of realism, antirealism, and relativism discussed in the recent literature, so that *Critical Scientific Realism* can be read also as a high-level textbook, containing one of the most learned and complete expositions of the subject to date. The reader interested in the recent debate on Niiniluoto's philosophy of science should read *Approaching Truth* (College Publications, 2007), a *Festschrift* edited by Sami Pihlström, Panu Raatikainen, and Matti Sintonen, collecting a number of papers by leading scholars devoted to his work in three wide areas: 1) philosophy of logic, of language, and of mathematics; 2) induction, truthlikeness, and scientific progress; and 3) epistemology, culture, and religion.

Before starting the interview, I wish to thank Federica Russo, Jon Williamson, and Lorenzo Casini for their invitation to open this issue and for their editorial work; and Roberto Festa and Luca Tambolo for many conversations on the topics of the interview, which inspired most of the questions below.

Gustavo Cevolani
Philosophy, Bologna

§2
Features

Interview with Ilkka Niiniluoto

Gustavo Cevolani: First of all, thank you for agreeing to be this month's interviewee. As usual, let me start by asking you about your intellectual history. How did you first get into research in logic and philosophy of science? Who had the greatest influence on your philosophical career?

Ilkka Niiniluoto: I did my Master's degree in mathematics in 1968, specializing in probability theory and Bayesian statistics with Professor Gustav Elfving. At the same time, I had started to study philosophy and mathematical logic with Professor Oiva Ketonen. The philosophical devotion and personal integrity of Academician Georg Henrik von Wright made a strong impression on me. I had already decided to move from mathematics to theoretical philosophy when Professor Jaakko Hintikka appointed me his research assistant in the summer of 1971. Hintikka's distributive normal forms and his measures of inductive probability and semantic information provided me the basic tools for the study of theoretical terms and inductive inference. The most inspiring and valuable lessons in philosophical methodology I have learned from Hintikka.

GC: You were trained in the tradition of the "Finnish school" of inductive logic, pursuing the research inaugurated by Eino Kaila, von Wright and Hintikka. In retrospective, what have been the most important contributions of this school? How lively is this tradition today?

IN: Von Wright's treatment of eliminative induction was an important contribution, but it is not much discussed today. The greatest achievement of the Finnish school was Hintikka's system of inductive generalization which improved Carnap's inductive logic by showing how universal statements in infinite domains can receive non-zero probabilities. Hintikka's students—including Risto Hilpinen, Raimo Tuomela, Juhani Pietarinen and myself—then developed and applied this insight in various directions. My own work

on truthlikeness and its estimation is also a continuation of this tradition. Hintikka himself downplayed the role of induction in his interrogative model of inquiry in the 1990s. It is a little disappointing to see that Hintikka's achievement is often ignored by Bayesian scholars who either reject inductive logic or work within the Carnapian framework. The models of induction in Artificial Intelligence are less sophisticated than Hintikka's system. But I am happy that there are philosophers in other countries—among them Theo Kuipers and Roberto Festa—who have made progress along the lines of the Finnish school.

GC: The post-Popperian research programme on truthlikeness (aka verisimilitude, or truth approximation) is a distinguished approach to the central problems of contemporary philosophy of science. Your 1987 book, *Truthlikeness*, is a milestone of this programme, exploring both the logical definition of verisimilitude and its methodological applications. However, the entire programme failed, at least until now, to gain wide acceptance and visibility among philosophers of science. First, truthlikeness is still often conflated with different concepts like probability, approximate truth, partial truth, and so on. Second, its role for the axiology and the methodology of science is largely underestimated and sometimes plainly ignored. What are the reasons of this situation, in your opinion?

IN: Truthlikeness is a fascinating topic which has kept me active already for 36 years, and there is still much research to be done in this area. The community of logicians working seriously on this theme is relatively small, and there is a lot of disagreement about the right approach. Many philosophers who are fond of the realist idea of truth approximation have found the logical treatments of truthlikeness too technical or "Carnapian"—Popper himself never gave me any reference or personal communication, even though I succeeded to save the notion of verisimilitude with an explication that satisfies all the central Popperian desiderata. As there is no consensus so far about the basic principles of truthlikeness, it may be difficult for other philosophers of science to appreciate the important conceptual distinctions, so that they simply work with an intuitive notion of "approximate truth". It is also easy for them to ignore the potential of the precise concept of truthlikeness for wider issues in the philosophy of science. The situation is different from the role of probability: in spite of various interpretations, there is an accepted standard mathematical explication of this notion. On the other hand, there are also hot disputes about many other important concepts in the philosophy of science—such as theory, model, truth, confirmation, lawlikeness, explanation, and reduction.

GC: Verisimilitude plays a crucial role in your own version of "critical scientific realism". You have been defending scientific realism since the beginning of your career, in the early Seventies. At that time, anti-realism (in its instrumentalist version) was widespread and became very fashionable shortly after, with the publication of *The Scientific Image* by Bas van Fraassen (1980). Today, the trend may appear to be reversed. Last year, the PhilPapers website organized a survey on a number of central philosophical questions. Among 1800 professionals (PhDs or faculty members), over 70% is reported to "accept or lean toward" scientific realism (although the figure falls toward 50% among those broadly specialized in philosophy of science). How do you judge the results of this poll and, more generally, the present state of the realism/anti-realism debate?

IN: I am glad to hear about this relative success of scientific realism. Arthur Fine was wrong when he announced the death of realism some twenty-five years ago. Of course one should remember, as I tried to show in my *Critical Scientific Realism* (1999), that there are many interesting forms of realism and anti-realism. One can reliably predict that this debate will always be a vital issue in the philosophy of science. During the last decade, structural realism has gained popularity, and internal realism has lost ground. But my guess is also that "leaning toward scientific realism" is quite common among those scholars who are working within the philosophy of special sciences: they have to rely on some sort of realist interpretation when they take a serious look at the contents of the best theories in physics, biology, medicine, psychology, economics, and sociology.

GC: The survey mentioned above reports a slight majority (56%) of philosophers leaning toward moral realism, rising to over 60% among the specialists of normative ethics and meta-ethics. In your *Critical Scientific Realism*, you defend realism in ontology, semantics, epistemology and methodology but accept (a form of) moral relativism. Can you elaborate a bit on this point? In particular, if "moral facts" are human-made and then relative to time, culture, etc., what is the difference between them and other human artefacts?

IN: I have indeed defended "moral constructivism" which treats moral values and principles as human-made social artifacts. Moral facts differ from some other human artifacts by their Durkheimian coercive force—their power in guiding our actions and decisions. In this sense, morality is a "real" phenomenon in the Popperian World 3. It is an extremely important aspect of our life and social interaction, but it has no transcendent (religious or metaphysical) ground independently of human activity. Morality cannot be reduced to natural facts about human needs or evolution, either: individually and socially, we are free to critically reconsider and renew the moral standards prevailing in our community. This sort of modest relativism is compatible with human responsibility, tolerance towards different value systems, and attempts to reach world-wide agreements on human rights.

GC: If you had to suggest a direction of research to young philosophers of science starting out today, what are the topics that you would recommend?

IN: There are still important and largely open problems in inductive logic: inductive reasoning with observational errors and inductive systems with relational predicates. The connection between truth approximation and belief revision models is a promising area. Another up to date topic is the analysis of abductive inference in terms of probability and truthlikeness. A young logician could also spend some time in going through the related work in the field of Artificial Intelligence. Illumination of the key ideas of scientific realism in historical case studies would also give opportunities for interesting research projects.

GC: A question of a more general nature. In the Preface to your Festschrift, the reader learns that, as "one of the most prominent public intellectuals in Finland", you have "constantly defended science and reason". Which are, in your opinion, the worst enemies of reason today? Don't you think that a middle course is needed between two equally dangerous extremes, the "Scylla" of relativism and the "Charybdis" of scientism?

IN: In my view, the most dangerous enemies of reason come from circles that base their beliefs and practices upon irrational faith and superstition with a hostile attitude towards scientific inquiry. Radical forms of postmodern relativism may give support to such communities. The reliance on science is not as such dangerous, since science itself is the critical way of forming beliefs about the world on the basis of public evidence. The mistake of scientism lies in its overstatement of the scope of scientific reason: even though scientific knowledge is relevant for most urgent decision problems, the scientists have no monopoly for solving value questions within a free democratic society.

GC: Regarding scientism, sometimes one is under the impression that large parts of the scientific community don't practice what they preach. On the one hand, scientists adopt a Popperian jargon, willingly assenting to the idea that theories are always conjectural and open to revision. On the other hand, they become very touchy when their pet theories are challenged, and seem often motivated by ideological, political or economic reasons. In this connection, let me mention two recent episodes. The first is the publication of Fodor and Piattelli-Palmarini's *What Darwin Got Wrong* (London, 2010), which is giving rise to much debate also in my country (one of the authors is Italian). The second is the so-called Climategate, concerning some hacked documents seemingly showing an attempt to minimize or conceal evidence about climate change. In both cases (admittedly very different in nature), some scientists violently reacted in defence of a purported scientific consensus about, respectively, (neo-)Darwinian evolutionism and anthropogenic global warming. In your opinion, is there a danger of scientific dogmatism? What have philosophers to say, and to do, about these episodes?

IN: As a critical scientific realist, I am a fallibilist who endorses the corrigibility of all human knowledge. Scientific dogmatism is harmful, since it is in conflict with the self-corrective nature of science and inhibits scientific progress. But scientists themselves should be able to estimate the reliability of their tentative conclusions. When the scientific community reaches a consensus on some question, open criticism should still be allowed, but naturally a change in the prevailing opinion would need strong scientific counter-arguments and new evidence. As experts of critical thinking, philosophers should assist in such episodes by assessing the weight of the rival arguments and positions.

Kaplan on indexical logic

It is a simple matter of grammar that it is predicates of 'that'-clauses, rather than predicates of mentioned sentences, that are equivalent to operators on used sentences (see 2010a: "On Forgetting 'that"', *The Reasoner* 4.4, 57-8). So 'It is true/necessary that I am here now', for instance, in which there are operators 'It is true/necessary that' on a used sentence, is equivalent to 'That I am here now is true/necessary', and not "'I am here now" is T/N' for any predicates 'T' or 'N', of the now mentioned sentence 'I am here now'. The difficulty for the main line logical tradition on this issue has been that there is no term forming element (like 'that') in standard formal languages transforming a sentence into a nominal phrase referring to the proposition the sentence expresses, when used. And this has led to considerable confusion, through attempts to make predicates of mentioned sentences do the job of predicates of 'that'-clauses (see 2010b: 'What Priest (amongst many others) has been missing', *Ratio* XXIII.2, 184-198).

The specific example of this confusion just given arises in the work of David Kaplan. For one significant, repeated assertion of Kaplan's is that it is the *content* of a sentence (i.e., the proposition expressed) that carries the truth-value. Thus we find, for example, (Almog, J., Perry, J., and Wettstein, H. (eds) 1989: *Themes from Kaplan*, O.U.P., Oxford, 500):

> What is said in using a given indexical in different contexts may be different. Thus if I say, today, 'I was insulted yesterday', and you utter the same words tomorrow, what is said is different. If what we say differs in truth-value,

> that is enough to show that we say different things. But even if the truth-values were the same, it is clear that there are possible circumstances in which what I said would be true but what you said would be false. Thus we say different things.

But, on the other hand, in his discussion of the sentence 'I am here now', Kaplan talks about (mentioned) sentences being true. He says (Almog et al 1989: 508-9):

> Consider the sentence (6) I am here now ... Intuitively, (6) is deeply, and in some sense, which we shall shortly make precise, universally true. One need only understand the meaning of (6) to know that it cannot be uttered falsely. ... Let the class of indices be narrowed to include only the *proper* ones—namely those (w, x, p, t) such that in the world w, x is located at p at the time t. Our reform has the consequence that (6) comes out, correctly, to be logically true. Now consider (8) □ I am here now. Since the contained sentence (namely (6)) is true at every proper index, (8) also is true at every proper index and thus also is logically true. ... But (8) should not be *logically true*, since it is false. It is certainly *not* necessary that I be here now. ...

Because of his point here, Kaplan has claimed that the rule of Necessitation fails in the presence of indexicals—the rule of Necessitation being commonly written as the inference from '⊢p' to '⊢Lp', where 'L' is the operator 'It is necessary that'.

Kaplan's confusion here can be pinpointed by focusing on what he said when using the sentence 'It is certainly *not* necessary that I be here now'. For he did not assert then that the sentence 'I am here now' is not necessary, but instead that the proposition *that he (in particular) was where he was at the time in question* was not necessary. But is the reverse of this what (8) says?

The difficulty of seeing clearly what (8) says is not helped by the omission of quotation marks after '(6)' and '(8)' in the text. That is a common convention in the formal logic tradition, but in the present context it only helps to blur the needed distinction between talk about words and talk about what they mean. Specifically, if (6) is the sentence 'I am here now' then is it intended that (8) be '□ I am here now' with '□' the operator on used sentences 'It is necessary that'? So (8) has the form 'Lp'? Or is (8) intended to be '□ "I am here now"', with '□' some predicate of mentioned sentences? It cannot be the former that is intended, since at no proper index does it then express a proposition that is true. So is '□' the predicate of mentioned sentences 'is valid' that Kaplan later defines as 'in every [proper] context expresses a proposition that is true' (Almog et al. 1989: 596)? So (8) has the form 'V'p"? But why, then, should (8) not express a logical truth? The sentence 'I am here now' does express a true proposition in every proper context—by the definition of 'proper context'.

So does Necessitation fail in the presence of indexicals? As before, Necessitation is the inference commonly written as above; but that is only because of the convention about omitting quotes, since '⊢' (unlike 'L') is a meta-linguistic symbol. So the rule would be better put as the inference from '⊢'p" to '⊢'Lp". Now certainly if '⊢' was Kaplan's 'is valid' then the inference would be invalid, if 'p' was 'I am here now'. But '⊢' is not 'is valid', since the former is not confined to proper contexts, and even Kaplan acknowledges that the latter must be distinguished from 'it is necessary that' (Almog et al. 1989: 596). Thus (6) is not 'logically true' as Kaplan claims above. Obviously 'Necessitation' does not hold if its premise is re-interpreted as not showing something is necessary! In fact it is false both that ⊢'p', and that ⊢'Lp', for the given 'p'. So Necessitation does not fail in the presence of indexicals.

Hartley Slater
Philosophy, University of Western Australia

§3 News

Degrees of Belief vs Belief, 14–15 May

Here is a summary of the invited talks of the workshop *Degrees of Belief vs Belief*, which took place on 14th-15th May and was hosted by the University of Stirling.

David Christensen (Brown): "Rational Reflection". The main question of the paper concerned the relationship between what it is rational for one to believe and what it is rational for one to believe about what it is rational for one to believe. Christensen approached the issue mainly in the context of graded belief. He formulated a rational reflection principle: Cr (A/Pr(A)=n)=n, where Cr stands for the agents credences, and Pr stands for the credences that would be maximally rational for someone in that agents epistemic situation. Christensen showed how this *prima facie* plausible principle leads to some puzzling results and explored a number of different reactions to the puzzling cases.

Peter Milne (Stirling): "Belief, Degrees of Belief, and Assertion". On the basis of an in-depth discussion of the role of assertion and the relationship between assertion and belief, Milne went on to discuss two puzzling issues: The first concerned the assertion of indicative conditionals. Much recent research in the psychology of reasoning supports two theses: that peo-

ple ascribe to the indicative conditional the so-called defective truth-table in which an indicative conditional with false antecedent is deemed neither true nor false; and that people assign as probability to an indicative conditional, the (conditional) probability of consequent conditional upon antecedent. The second issue Milne discussed concerned the relationship between assertion and degrees of belief. Certain well known cases suggest that a high degree of belief is neither necessary nor sufficient for a willingness to assert.

Brian Weatherson (Rutgers/Arché): "Rational Belief and Rational Action". Weatherson discussed the principle, defended by Jeremy Fantl and Matthew McGrath, that if S's belief that p is justified, then it is permissible for S to use p as a premise in practical reasoning. Weatherson argued that the principle is false. In cases where the agent has some rational beliefs and some irrational beliefs, it might be that justification is insufficient to ground action. Weatherson went on to discuss a novel suggestion regarding the relationship between rational beliefs and rational degrees of belief.

Alan Hájek (ANU): "Staying Regular". Hájek first reviewed several arguments for regularity as a norm of rationality. There are two ways an agent could violate this norm: by assigning probability zero to some doxastic possibility, and by failing to assign probability altogether to some doxastic possibility. Williamson and Easwaran have argued forcefully that the former kind of violation may be unavoidable. Hájek's discussion focused on violations of the second kind. Both kinds of violations of regularity have serious consequences for traditional Bayesian epistemology, in particular conditional probability, conditionalization, probabilistic independence and decision theory.

Carl Hoefer (Barcelona): "Connecting Objective and Subjective probability: How to Justify the Principal Principle". Hoefer focused on David Lewis' Principal Principle and the claim that "Truth is to belief as agreement with objective chance is to degree of belief". The plausibility and defensibility of these theses depend, clearly, on how we understand objective chance. The paper introduced an account of objective chance: a Humean/reductive account closely related to Lewis' own. One of the key virtues of this account of chance is that it allows us to demonstrate that the PP is indeed a requirement of rationality. Hoefer also argued for a second thesis on which agreement with actual frequencies, rather than chances, serves as the core virtue for degrees of belief.

Branden Fitelson (Berkeley) & Kenny Easwaran (USC) "Partial Belief, Full Belief, and Accuracy-Dominance". The paper had two main aims: (1) to make some (cautionary) remarks about the set-up and interpretation of some recent accuracy-dominance based arguments for probabilism (with respect to partial beliefs), and (2) to discuss some interesting (formal and informal) analogies (and disanalogies) between partial belief and full belief, when it comes to the phenomenon of accuracy-dominance. In particular, Fitelson and Easwaran discussed the case of an extremal agent (who can only assign degrees of belief 0 or 1) and showed that there are non-probabilistic extremal functions that are not even weakly dominated by any probabilistic extremal function (using the Brier score).

Philip Ebert
Department of Philosophy, University of Stirling

Martin Smith
Department of Philosophy, University of Glasgow

Logic and Knowledge, 16–19 June

The conference, reminiscent of Russell's classical book *Logic and Knowledge*, took place from June 16 to 19 in the Faculty of Philosophy at La Sapienza University of Rome. It was organized by Emiliano Ippoliti, Carlo Cellucci, Emily Grosholz, and aimed to explore the connection between logic and knowledge, in particular the interconnections among epistemology, philosophy of logic and philosophy of mathematics, in order to provide a more comprehensive and articulated view of the topics dealt with.

The cooperation between speakers and discussants, as well as the depth of the discussions, allowed the conference to fulfilling its major aim, i.e. to offer new view points on logic, epistemology and their relations.

The conference was opened by Donald Gillies' (University College London) talk on the empiricist view of mathematics. Gillies, criticizing Quine, suggested that quantum logic does not give a decisive argument in favour of this view, but that such an argument is provided by the successful application of non-classical logics in Artificial Intelligence.

Mario De Caro (University of Roma Tre) in his talk argued for the conclusion that if we have reasons for believing that neurobiology can enrich our understanding of the features of the human mind, there is no sound reason for thinking it will ever explain them all, and he discussed the case of free will to support his conclusion.

After the lunch break, Michael Detlefsen (University of Notre Dame), in his talk about rigor, logic and intuition considered various conceptions of rigor, the benefits of rigor so conceived, or supposed to be, what roles logical reasoning has been taken to play in the attainment of rigor and whether and/or under what conditions it may indeed serve in such a roles.

Göran Sundholm (University of Leiden) in his paper offered a comparison between the tree-like representations for the grounding of knowledge and of truths that

are offered by Frege and Bolzano.

Carl Posy (The Hebrew University of Jerusalem)—starting from David Hilbert's famous lecture "On the Infinite" which invokes Kant's philosophy of mathematics to endorse the need for intuitive finitary reasoning in mathematics—discussed Kant's analysis of the notion of finite grasp and the issues that arise when we mix certain ideal ideas of reason into the realm of the empirically real.

The second day was opened by Riccardo Chiaradonna (University of Roma Tre) talk about Galen's medical epistemology. Chiaradonna focused on Galen's views about the epistemic status of medicine, pointing out that Galen argues that demonstrative methods have an intrinsic heuristic value and he seeks to transpose the 'analytical' geometrical method of resolution of problems into the domain of medicine.

In her talk on the importance of sight and hearing in 17th and 18th century logic, Mirella Capozzi (University of Roma La Sapienza) pointed out that the relation between logic and sight was favored by many authors of logical calculi. She also argued, however, that some of such authors believed that logic should investigate methods of discovery by taking inspiration from the arts of discourse, so strictly connected to hearing and to the vague meanings of spoken words.

The morning session ended with the talk of Jan von Plato, (University of Helsinki), on the dimensionality of deductive arguments. Von Plato showed through historical examples from Aristotle, Hilbert and Bernays, and Gentzen, that the tree form has decisive advantages over a linear arrangement.

Timothy Williamson (University of Oxford) considered and questioned Michael Dummett's contention, in *The Logical Basis of Metaphysics*, that semantic theories should be formulated in such a way that the logic of the object-language is maximally insensitive to the logic of the meta-language. Examining the status of the Barcan formula and its converse in quantified modal logic as a case study, Williamson argued that the insensitivity in question is a less desirable feature of a semantic theory than Dummett suggests.

Cesare Cozzo (University of Roma La Sapienza) discussed and questioned Williamson's contention, in *Knowledge and its Limits*, that "knowing is the most general factive stative attitude, that which one has to a proposition if one has any factive stative attitude to it at all". According to Cozzo, Williamson does not prove that his principle that factive-stative attitudes entail knowledge and he considered a counterexample in order to show that. Emiliano Ippoliti (University of Roma La Sapienza) ended the day with a talk about the issue of ampliation of knowledge. He argued that the generation of knowledge requires revising the notions of inference, logic and knowledge from an informational point of view, examining how information is generated, extracted, processed and transferred. He discussed the Feynman Integral Path as case study.

The third day was opened by Dag Prawitz (University of Stockholm), who argued for the need of the Aristotelian distinction between perfect and imperfect syllogisms, in order to say what a proof is and to explain how inferences can generate knowledge, and he tried to offer a systematic approach to the issue.

Reuben Hersh (University of New Mexico) started his talk playing with Jody Azzouni a dialogue between a teacher of mathematics and a student and then he discussed, in mathematical practice, the notion of mathematical intuition and the validity of heuristic and computational reasoning in mathematics—both pure and applied.

After the lunch break, Carlo Cellucci (University of Rome La Sapienza), gave his talk about classifying and justifying inferences. He offered a new classification and justification of inferences (deductive, non-deductive and abductive) which takes into account their role in knowledge. He argued that the justification of deductive, non-deductive and abductive inferences raises similar problems and is to be approached much in the same way.

Emily Grosholz (The Pennsylvania State University) talk offered a philosophical critique of logic. In fact, she argued, logic must treat its terms as if they were homogeneous, to exhibit valid inferences, but the kinds of representations that make successful reference possible and those that make successful analysis possible in mathematics and the sciences often juxtapose heterogeneous terms.

Robert Thomas (University of Manitoba), in his talk assimilated mathematics to science and discussed the operation of assimilation. He pointed to assimilations in history that would not happen today, abandoned assimilations failing to make important distinctions, and current assimilations that are controversial. He suggested that the lack of assimilations in mathematical practice is an important reason for the dependability of arbitrarily long chains of reasoning uniquely in mathematics.

The conference program closed on Saturday with two talks. Roberto Cordeschi (University of Roma La Sapienza), offered a discussion of Herbert Simon's approach to the study of rational choice, and he regarded it as more than a starting point for evaluating an integrated approach to the study of behaviour.

The last talk was given by Jody Azzouni (Tufts University), who criticized the idea that there is the way the world is, and that such a way can be characterized in purely nominalistic terms. He tried to argue that the indispensability of mathematics to the languages of the sciences shows that this is false and he tried to refute the possibility that the indispensability of mathematics screens us off from what the world itself is like, showing that we can characterize aspects of the world that

are really out there.

Emiliano Ippoliti
Faculty of Philosophy, "La Sapienza" University of Rome

Square of Opposition, 20–22 June

Two concepts and one famous name strikingly come to one's mind when opposition is dealt with: incompatibility and negation, on the one hand; Aristotle, on the other hand. Can there be more to be said about the well-known theory of opposition, or is it just an old-fashioned by-product of logic for undergraduate students? In order to address this question, the philosopher and logician Jean-Yves Béziau created a periodic meeting since 2007 (in Montreux, Switzerland); consequently, the Second World Congress on the Square of Opposition has taken place in the University of Corte (Corsica, France) from 20th to 22nd June 2010. Despite its somehow restrictive title, this worldwide event purported to give an updating overview of the concept of opposition as such, whether organized in a basic square or any more complex structure. More generally, the point was to see how opposition can be entertained or applied to so many various disciplines like philosophy, linguistics, mathematics, psychology, computer science or cognitive science.

The Congress consisted in two distinct sorts of talks, whether from invited speakers or contributors. Among the four invited speakers, Pierre Cartier proposed an investigation of infinity and its paradoxical import, thus leading to the topic of paraconsistency and contradiction in mathematics. Stephen Read recalled the legacy of the medieval logician John Buridan with respect to the theory of opposition, and he exemplified this with a special theory of truth where temporal and modal expressions result in an intriguing logical octagon. Sliding from the Middle Age to the 20th century, Damian Niwinski proposed a reconstruction of Zermelo's theorem about chess games in terms of fixed-point calculus and modal oppositions, while Hartley Slater returned to the famous existential import problem and showed how this problem could be viewed from another perspective than the usual quantification.

As to the fifty-four contributors, the various sorts of talks helped to give clues to several fundamental questions about the theory of opposition: how it came to be within the area of philosophy, how it has been developed and improved through the ages and scientific disciplines, what is it its expected utility for solving scientific problems. The linguists notably emphasized the ambiguous use of negation in ordinary discourse and the plurarity of its geometrical representations, while the mathematicians showed how opposition is deeply rooted through group theory or category theory. The philosophical and logical contribution purpoted to exemplify the theoretical development of the theory of opposition after Aristotle's square and Robert Blanché (and Augustin Sesmat)'s hexagon: fuzzy logic gives rise to an indefinite seriation of logical oppositions; accordingly, an extension of opposite terms gives rise to an indefinite sequence of polygons whose geometrical properties respect the scientific criteria of rigor and fruitfulness (Alessio Moretti's n-opposition theory: N.O.T.); finally, the philosophical roots of logical opposition don't prevent this concept from being reduced to an algebraic approach and introduced into an alternative logic where inconsistency is the central property. In a nutshell, a number of topics from history of philosophy to philosophy of logic have been considered from the point of view of the theory of opposition, among which: non-classical logics, the theory of negation, (dynamic) epistemic logic, logical pluralism, Eastern logics, Arabic logic, categoricity, speech act theory, universal logic.

The Third Congress on the Square of Opposition is announced for 2012 and should take place in Crete. Beyond the huge variety of topics to be addressed, a crucial question that covers these is about the scientific value of the concept of opposition: how relevant is it for scientific thought, and what does its proper contribution amount to in the history of ideas? A tentative answer has been already given through the first two events, pending the third one.

Fabien Schang
Dresden University of Technology, Germany

Inductive Logic Programming, 27–30 June

The 20th International Conference on Inductive Logic Programming (ILP 2010) has been held in Firenze, Italy, chaired by Paolo Frasconi (Università degli Studi di Firenze) and Francesca A. Lisi (Università degli Studi di Bari "Aldo Moro"). The program featured 31 accepted papers (see here), 3 invited talks (here) and 2 tutorials (here). Contributions spanned from theory to practice, mainly within the stream of the so-called Statistical Relational Learning (SRL). Here is a summary of the principal new ideas (presenters' names are in italics).

Best Student Paper: "From Inverse Entailment to Inverse Subsumption" (*Yamamoto*, Inoue, Iwanuma) shows how IE can be reduced to inverse subsumption by preserving its completeness.

"Approximate Bayesian Computation for the Parameters of PRISM Programs" (*Cussens*) presents a Bayesian method for approximating the posterior distribution over PRISM parameters.

"Applying the Information Bottleneck Approach to

SRL: Learning LPAD Parameters" (*Riguzzi*, Di Mauro) adopts the Information Bottleneck approach for learning LPAD parameters.

"Extending ProbLog with Continuous Distributions" (*Gutmann*, Jaeger, De Raedt) extends ProbLog with abilities to specify and infer over continuous distributions.

"Probabilistic Rule Learning" (*De Raedt*, Thon) upgrades rule learning to a setting in which both the examples and their classification can be probabilistic.

"Boosting Relational Dependency Networks" (*Natarajan* et al.) proposes the use of gradient tree boosting in RDNs.

"Multitask Kernel-based Learning with First-Order Logic Constraints" (*Diligenti* et al.) defines a general framework to integrate supervised/unsupervised examples with background knowledge in the form of FOL clauses into kernel machines.

"Stochastic Refinement" (*Tamaddoni-Nezhad*, Muggleton) introduces the notions of stochastic refinement operator and search.

"Hypothesizing about Networks in Meta-level Abduction" (*Inoue*, Doncescu, Nabeshima) deals with completing causal networks by means of meta-level abduction.

"Learning Discriminant Rules as a Minimal Saturation Search" (*Lopez*, Martin, Vrain) defines a non-blind bottom-up search strategy for hypotheses.

"Speeding up Planning through Minimal Generalizations of Partially Ordered Plans" (*Cernoch*, Zelezny) presents an ILP framework for planning which exploits existing plans in new similar planning tasks.

"Exact Data Parallel Computation for Very Large ILP Datasets" (Srinivasan, Faruquie, *Joshi*) shows how distributed computing can be used effectively in ILP.

"Automating the ILP Setup Task: Converting User Advice about Specific Examples into General Background Knowledge" (*Walker* et al.) introduces some techniques to automate the use of ILP systems for a non-ILP expert.

"Fire! Firing Inductive Rules from Economic Geography for Fire Risk Detection" (*Vaz*, Santos Costa, Ferreira) provides an elegant and powerful approach to spatial data mining by coupling Spatial-Yap with an ILP engine.

The invited talks were very inspiring. Kifer argued that RIF, a W3C recommendation for the exchange of Semantic Web rules, is a major opportunity to rekindle the interest in logic programming. Pfeffer presented a new probabilistic programming language named Figaro that is designed with practicality and usability in mind. Poole claimed that SRL and ILP need to be a foundation of the Semantic Web.

Francesca A. Lisi
Dipartimento di Informatica, Università degli Studi di Bari "A. Moro"

Work in Progress in Causal and Probabilistic Reasoning, 28-29 June

Federica Russo and Phyllis McKay Illari from the University of Kent recently organised an international workshop titled 'Work in Progress in Causal and Probabilistic Reasoning'. The workshop took place in the afternoon of June 28th and the morning of June 29th. Paris, more precisely, the campus of the University of Kent at Paris, formed the congenial venue for the meeting, with its wood-panelled rooms and flower-filled courtyards.

The aim was to form a hub for exchanges between graduate students and experienced researchers in the field. Jon Williamson, Phyllis McKay Illari and Federica Russo from Kent, Julian Reiss from Rotterdam, Margherita Benzi from Vercelli, and Bert Leuridan and Leen De Vreese from Gent were the more experienced researchers in the field who took part in the workshop, fostering the exchange of thoughts through feedback, additional presentations, and the leading and feeding of discussions. But it was primarily the attendance and the contributions of the participating young researchers from Kent, Rotterdam, London, and Paris, which made the workshop a success. Taken all together, a wide range of topics related to causation were covered during the two half-days of talks: causal pluralism (Leen De Vreese), causal contextualism (Michael Wilde), Glennan-style mechanisms and complex systems (Lorenzo Casini), causal evidence in economics (François Claveau), causation and explanation (Conrad Hughes), causation and constitutive relevance (Adam White and Bert Leuridan), causal inference in the social sciences (Attilia Ruzzene), and invariantism and probability (Eric Raidl). Plenty of time was reserved for feedback and discussion on purpose, to give graduate students the experience of academic debate at a research level.

The whole organizational set-up clearly formed a fruitful venue, in which junior researchers could learn in an informal setting, not only about the content of their own and others' research work, but also about presenting and giving feedback more generally. A follow-up workshop with the same aims, to continue this work, would be highly recommended.

Leen De Vreese
Centre for Logic and Philosophy of Science, UGent

Automated Reasoning about Context and Ontology Evolution, 16–17 August

In computer science an ontology is a formal representation of the knowledge used by computer applications. Contexts play a key role in ontology dynamics.

An ontology can be compared with its different versions under many respects. For instance, the choice of the specification language matters: one should strive for the appropriate balance between expressiveness and complexity. Description logics (DLs) are widely used thanks to the good balance they strike. Other languages, though, may be used to support more expressiveness or ease of use, like higher-order logics, modal logics, RDF, among others. On the other hand, the same ontology can be compared with itself relative to its evolution over time, dictated by new requirements or changes in the domain knowledge.

Understanding how to automate the evolution of ontologies and the role that contexts play in it was the central theme of ARCOE-10, held at ECAI-10, in Lisbon. The two-day workshop had two invited talks, nine regular presentations, a participants and a panel discussion.

Prof. Meyer gave an invited talk on ontology dynamics and its relationship with belief change and nonmonotonic reasoning. Prof. Giunchiglia's invited talk covered the notion of knowledge diversity and stressed the importance of relating localized semantics to shared semantics.

Two contributed talks by Ribeiro and Wassermann and by Meyer, Moodley and Varzinczak brought techniques from belief revision to the ontology case. With similar motivations, Nguyen, Alechina and Logan showed how to use assumption-based truth maintenance systems for debugging ontologies. Lehmann, Bundy and Chan analyzed the evolution of physics theories by qualitative causal analysis of experimental data. Wallace and Naz focused on the role of contexts in ontology construction; Chan, Bundy and Lehmann used contexts in detecting conflicts between ontologies; d'Amato and Fanizzi presented a machine learning approach to comparing entities in a given context. Finally, Pease and Benzmueller presented in one talk the historical evolution of the SUMO ontology and in another talk a higher-order logic approach to embedding formulas in SUMO.

Two discussions about the relationships between the talks made clear the value of a multi-disciplinary forum like ARCOE. During the panel discussion Giunchiglia pointed out the fundamental problems of the Semantic Web endeavor and of its deductive approach. Thomas Meyer stressed the differences between semantic web and semantic technologies: even if the semantic web endeavor might eventually fail, this does not prevent us from taking advantage of specific existing semantic technologies, which have proven to be useful. Fanizzi commented on how to bring methods from machine learning to ontology evolution and also pointed out the main issue involved in semantic technology: where to get the relevant data from?

There are plans to continue the ARCOE collaboration and to reach out other communities interested in ontologies, context and reasoning. More information on the website.

Alan Bundy
School of Informatics, University of Edinburgh, UK

Jos Lehmann
School of Informatics, University of Edinburgh, UK

Guilin Qi
School of Computer Science and Engineering,
Southeast University, China

Ivan José Varzinczak
CSIR Meraka Institute, Pretoria, South Africa

Calls for Papers

Logic and Natural Language: special issue of *Studia Logica*, deadline 3 September.
The Extended Mind: special issue of *Teorema*, deadline 1 October.
Recurrence, Provability and Truth: special issue of *Logos Architekton*, deadline 15 October.
From Embodied Cognition to Free Will: special issue of *Humana.Mente*, deadline 30 October.
AILACT Essay Prize: in Informal Logic / Critical Thinking / Argumentation Theory, with publication on *Informal Logic*, deadline 31 October.
Philosophical History of Science: special issue of *The Monist*, deadline 31 October.
Categorical Logic: special issue of *Logica Universalis*, deadline 1 November.
Philosophy & Technology Best Paper Prizes: winning papers are published in *Philosophy & Technology*, deadline 1 November.
Concepts of Tradition in Phenomenology: special issue of *Studia Phaenomenologica*, deadline 15 November.
Social Cognition: Mindreading and Alternatives: special issue of the *Review of Philosophy and Psychology*, deadline 1 December.
Visual Reasoning with Diagrams: special issue of *Logica Universalis*, deadline 15 December.
Experimental Philosophy: special issue of *The Monist*, deadline 30 April 2011.
C. L. Hamblin and Argumentation Theory: special issue of *Informal Logic*, deadline 30 June.
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 with a sample first column.

...Logic and Rational Interaction

Conference season has started in the area of Logic and Rational Interaction as well, and reports on a number of recent events are already available on LORIWEB. The Paris-Amsterdam Logic Meeting of Young Researchers (PALYMR) took place in Amsterdam this year. Ines Crespo and Lucian Zagan *provide information* about the talks given. The Workshop on Solution Concepts for Extensive Games (SCEG '10) was organized by the Center for Algorithm Game Theory at Aarhus University and took place June 22-25, 2010. Peter Bro Miltersen *reports* on the workshop, which brought together computer scientists and game theorists. Paolo Turrini *discusses* his impressions gathered at the tenth edition of the International Conference on Deontic Logic in Computer Science. And Jean-Yves Beziau *provides information* about the second world congress on the square of opposition, which took place in Corsica this June.

Readers of The Reasoner may also be interested in the *Justification Logic Bibliography*, which has been updated with several new publications recently. Roman Kuznets *provides details*.

As usual, we would like to invite all readers of The Reasoner to contribute to LORIWEB with news on events, job openings or publications in the area of Logic and Rational Interaction. Please contact Rasmus Rendsvig, our web manager, or write to the loriweb address.

Ben Rodenhäuser
Philosophy, Groningen

...Algebraic, abstract algebraic and behavioral approaches to logical systems. Part II

In the previous contribution to *The Reasoner* it was observed that there are deductive systems which do not possess a *biconditional* ($\leftrightarrow$) determining logical equivalence. Consequently, it was claimed that these logical systems are not susceptible to the *Lindenbaum-Tarski process* of forming the quotient algebra from the formula algebra **Fm**. Hence, algebraically oriented logicians introduced the concept of the *Leibniz congruence* ($\Omega(T)$) and by using it the Lindenbaum-Tarski process can be fully generalized and applied to any deductive system C.

Recall that $\Omega(T)$ defined on **Fm** over a theory T is characterized in the subsequent way: for any pair α, β of terms, $\alpha \equiv \beta$ (modulo $\Omega(T)$) if for every formula φ and any variable p occurring in φ, it is the case that $\varphi(p/\alpha) \in T$ if and only if $\varphi(p/\beta) \in T$. Then α and β are said to be *Leibniz-congruent* (modulo T). Identifying any theory T of C with the deductively closed set of formulas Φ it can be asserted that if α and β are Leibniz-congruent (modulo Φ), then

$$\Phi \cup \{\alpha\} \vdash_C \beta \text{ and } \Phi \cup \{\beta\} \vdash_C \alpha.$$

This *interderivability* condition is equivalent to Φ−*indiscernibility* of two Leibniz-congruent (modulo Φ) formulas. If Φ is the set of theorems of C, then this relation is said to be *synonymy* relation. It turns out that definition of $\Omega(T)$ depends only on the *structural* (i.e., *grammatical*) properties of the language of C. Hence if $\alpha \equiv \beta$ (modulo$\Omega(T)$), then α and β are *interchangeable* with respect to T in every context represented by any formula $\varphi \in$ **Fm**. It should be stressed that the definition of the Leibniz congruence is associated to the method of defining the *identity relation* in second-order logic that is due to Gottfried Leibniz. Recall that according to the famous *Leibniz Law* the identity can be expressed by the formula

$$\forall a \forall b\, [a = b \leftrightarrow \forall P\, (P(a) \leftrightarrow P(b))]$$

where P is a variable running over all unary predicates. This ontological principle states that two objects a and b are *identical* (i.e., they are the same entity), if they have all their properties in common. This means that a and b are identical if any predicate possessed by a is also possessed by b and *vice versa*. Consequently, it is obvious that according to this law the identity of two substances is defined by their *indiscernibility*.

In order to formulate this principle algebraically let us introduce the notion of a *logical matrix*. This *model-theoretic* concept generalizes the well-known (from elementary logic) notion of *truth tables*. Logical matrices are regarded as *models* for a logical language $\mathcal{L}$. Any logical matrix has the form $\mathcal{M} = \langle \mathbf{A}, F \rangle$ where $\mathbf{A}$ is an abstract algebra of type $\mathcal{L}$ and $F \subseteq \mathbf{A}$ is the set of *designated values*. The fundamental function of algebra in logic is to constitute *semantic correlates* of sentences. The term 'semantic correlate' is synonymous with such concepts as '*meaning*' and '*denotation*'. It is assumed

that each formula $\varphi \in \mathbf{Fm}$ has a uniquely determined *interpretation* in $\mathbf{A}$ depending on the values in $\mathbf{A}$ that are assigned to its variables. Then the interpretation of φ can be expressed algebraically as $h(\varphi)$, where h is a *homomorphism* (i.e., an *assignment*) from $\mathbf{Fm}$ to $\mathbf{A}$ mapping each variable of φ into its assigned value. Then $\mathbf{A}$ is identified with the universe of all possible interpretation, i.e., semantic correlates for each $\varphi \in \mathbf{Fm}$. Each such homomorphism $h : \mathbf{Fm} \to \mathbf{A}$ becomes a possible *semantic correlate function* from the language $\mathcal{L}$ to $\mathbf{A}$. Then any subset $F \subseteq \mathbf{A}$ is said to be a *truth predicate* (or a *truth set*). Therefore, it is said that a sentence φ is *true* in $\mathcal{M}$ if $h(\varphi) \in F$. Otherwise φ is *false* in $\mathcal{M}$.

Using logical matrices it is possible to reformulate Leibniz's second-order definition of identity. Namely it follows that

$$\Omega_{\mathbf{A}}(F) := \left\{ \langle a, b\rangle : \begin{array}{l} \varphi^{\mathbf{A}}(a, c_0, ..., c_{n-1}) \in F \text{ iff } \varphi^{\mathbf{A}}(b, c_0, ..., c_{n-1}) \in F \\ \text{for all } \varphi(x, z_0, ..., z_{n-1}) \in \mathbf{Fm} \text{ and all } c_0, ..., c_{n-1} \in \mathbf{A} \end{array} \right\}.$$

This is the first-order analogue of Leibniz's definition. The notation $\varphi(x, z_0, ..., z_{n-1})$ indicates that each of the variables from φ occurs in the list $x, z_0, ..., z_{n-1}$ and $\varphi^{\mathbf{A}}(a, c_0, ..., c_{n-1})$ is the algebraic interpretation of φ in $\mathbf{A}$, i.e., $h(\varphi)$ where h is any homomorphism $h : \mathbf{Fm} \to \mathbf{A}$ such that $h(x) = a$ and $h(z_i) = c_i$ for all $i < n$. The string of variables $c_0, ..., c_{n-1} \in \mathbf{A}$ is regarded as the sequence of *parameters*. Also it follows that $\Omega_{\mathbf{A}}(F)$ is a congruence on $\mathbf{A}$. Observe that the definition of $\Omega_{\mathbf{A}}(F)$ is completely independent of any logic C. It depends entirely on the grammatical properties of $\mathcal{L}$, i.e., it is defined *intrinsically* with respect to $\mathbf{A}$ and F. Then it is obvious that according to $\Omega_{\mathbf{A}}(F)$ two entities are identical iff they are indiscernible with respect to each property expressed by any first-order formula $\varphi \in \mathbf{Fm}$. It turns out that $\Omega_{\mathbf{A}}(F)$ is the main metalogical tool of *Abstract Algebraic Logic* (*AAL*).

Recall that in the framework of *AAL* we consider only *one-sorted* languages and algebras. While in the case of *Behavioral Abstract Algebraic Logic* (*BAAL*) it is necessary to use *many-sorted* languages and algebras. A *many-sorted signature* is a pair $\Sigma = \langle S, F\rangle$ where S is a set of *sorts* and $F = \{F_{ws}\}_{w \in S^*, s \in S}$ is an indexed family of sets of operations. For simplicity, it is written $f : s_1...s_n \to s \in F$ for an element $f \in F_{s_1...s_n s}$. Then the formula algebra $\mathbf{Fm}_\Sigma$ in *BAAL* is generated by a sorted family $X = \{X_s\}_{s \in S}$ of variable sets. The fact that $x \in X_s$ is denoted by $x : s$. Given a signature $\Sigma = \langle S, F\rangle$ it is said that a Σ*−algebra* (similar to many-sorted language) is a pair $A = \left\langle \{A_s\}_{s \in S}, {}_{-\mathbf{A}} \right\rangle$, where each A_s is a non-void set (*i.e.*,the *carrier of sort* s) and ${}_{-\mathbf{A}}$ assigns to each operation $f : s_1...s_n \to s$ a function $f_{-\mathbf{A}} : A_{S_1} \times ... \times A_{S_n} \to A_S$. An assignment over $\mathbf{A}$ is a S−sorted family of functions $h = \{h_s : X_s \to A_s\}_{s \in S}$. Given a Σ−algebra $\mathbf{A}$, a formula from $\mathbf{Fm}_\Sigma$, i.e., $\varphi(x_1 : s_1, ..., x_n : s_n)$ and $\langle a_1, ..., a_n\rangle \in A_{s_1} \times ... \times A_{s_n}$, then we denote by $\varphi^{\mathbf{A}}(a_1, ..., a_n)$ the value $h(\varphi)$ that φ takes in $\mathbf{A}$ under an assignment h such that $h(x_1) = a_1, ..., h(x_n) = a_n$. In our approach to *BAAL* it is assumed that the set of sorts is split in two disjoint sets V and H which are called *visible* and *hidden* sorts. Then a *hidden many-sorted signature* is a triple $\langle \Sigma, V, \mathcal{E}\rangle$ where $\Sigma = \langle S, F\rangle$ is a many-sorted signature, $V \subseteq S$ is the set of visible sorts and $\mathcal{E}$ is the set of available *experiments*. These experiments are identified with terms of visible sort of the form $t(x : s, x_1 : s_1, ..., x_n : s_n)$ where x is a designated variable of hidden sort, i.e., $s \in H = S \setminus V$. It follows that in *BAAL* it is possible to reason about *hidden data* only indirectly using *behavioral indistinguishability* with respect to the available experiments. Intuitively speaking, it is necessary to evaluate equations involving hidden values using only their visible properties. Such we arrive at the following definition:

Definition 1. Consider a hidden signature $\langle \Sigma, V, \mathcal{E}\rangle$ and a Σ−algebra $\mathbf{A}$. Then given a hidden sort $s \in H$ it is said that two values $a, b \in A_s$ are $\mathcal{E}$*−behaviorally equivalent*, symbolically $a \equiv_{\mathcal{E}} b$, if for every experiment $t(x : s, x_1 : s, ..., x_n : s_n) \in \mathcal{E}$ and every $\langle a_1, ..., a_n\rangle \in A_{s_1} \times ... \times A_{s_n}$ it is the case that $t^{\mathbf{A}}(a, a_1, ..., a_n) = t^{\mathbf{A}}(b, a_1, ..., a_n)$.

Concluding, it can be stated that in *BAAL* it is possible to observe the behavior of terms of hidden sorts by their indirect impact on the truth-values of the formulas which involve them.

Piotr Wilczek
Mathematics, Poznań University of Technology, Poland

INTRODUCING . . .

If you would like to write one or more short introductions to concepts, topics, authors or books connected with reasoning, inference or method, or if you have an editorial project to collate such pieces and would like to print some of them here, please email features@thereasoner.org with your proposal.

§5 EVENTS

SEPTEMBER

ICTAC: 7th International Colloquium on Theoretical Aspects of Computing, Natal, Brazil, 1–3 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.

CMM GRADUATE CONFERENCE: University of Leeds, 3 September.

THE CARTESIAN "MYTH OF THE EGO" AND THE ANALYTIC/CONTINENTAL DIVIDE: Faculty of Philosophy, Radboud University Nijmegen, 3–4 September.

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

CP: Principles and Practice of Constraint Programming, St. Andrews, Scotland, 6–10 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.

FEW: Formal Ethics Week, University of Groningen, 7–10 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.

Economics and Naturalism: Kazimierz Dolny, Poland, 11–15 September.

CNL: 2nd Workshop on Controlled Natural Languages, Marettimo Island, Sicily, Italy, 13–15 September.

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

Epistemic Aspects of Many-valued Logics: Prague, 13–16 September.

RSS: Royal Statistical Society International Conference, Brighton, United Kingdom, 13–17 September.

Vagueness and Metaphysics: Barcelona, 16–17 September.

Levels of Processing: Foundations of Social Cognition: University Club Bonn, 16–18 September.

Non-Classical Logic. Theory and Applications: Torun, Poland, 16–18 September.

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

GAMES: Annual Workshop of the ESF Networking Programme on Games for Design and Verification, St Anne's College, Oxford, UK, 19–23 September.

Words and Concepts: An Interdisciplinary Workshop on Philosophy, Psychology, and Linguistics: University of Granada, Spain, 20–21 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.

ECML: European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases, Barcelona, Spain, 20–24 September.

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

History, Cognition, and Visualisation in Science: The David Gooding Memorial Meeting: University of Bath, UK, 22–23 September.

Actual Causation: University of Konstanz, Germany, 23–24 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.

Workshop on Mental Causation: Durham University, 27 September.

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

Logic or Logics?: Workshop, Arché Research Centre, St Andrews, Scotland, 30 September - 1 October.

Truth, Meaning, and Normativity: Department of Philosophy, Institute for Logic, Language and Computation, Universiteit van Amsterdam, 30 September - 2 October.

Types of Explanation in the Special Sciences: the Case of Biology and History: University of Cologne, 30 September - 3 October.

October

AP-CAP: Asia-Pacific Computing and Philosophy Conference, Wellington Institute of Technology (WelTec), Petone, Wellington, New Zealand, 1–2 October.

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

Objectivity and the Practice of Science: Tilburg Center for Logic and Philosophy of Science, 5 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.

Validation in Statistics and Machine Learning: Weierstrass Institute, Berlin, 6–7 October.

Causality in the Biomedical and Social Sciences
Erasmus University Rotterdam, 6–8 October

The Limits of Knowledge Society: Iasi, Romania, 6–9 October.

Integrating Complexity: Environment and History: University of Western Ontario in London, Ontario, Canada, 7–10 October.

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

Philosophy of Mind, Reduction, Neuroscience: University of Lausanne, Switzerland, 12–16 October.

SEFA: 6th Conference of the Spanish Society for Analytic Philosophy, University of La Laguna, Tenerife.14–16 October

Philosophy of Scientific Experimentation: A Challenge to Philosophy of Science: Center for Philosophy of Science, University of Pittsburgh, 15–16 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.

Field Science: 26th Boulder Conference on the History and Philosophy of Science, University of Colorado at Boulder, 22–24 October.

Thinking and Speaking a Better World: 3rd International Conference on Argumentation, Rhetoric, Debate and the Pedagogy of Empowerment, Faculty of Arts, University of Maribor, Slovenia, 22–24 October.

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

MWPMW: 11th annual Midwest PhilMath Workshop, Philosophy Department, University of Notre Dame, 23–24 October.

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

BNAIC: 22nd Benelux Conference on Artificial Intelligence, Luxembourg, 25–26 October.

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

November

ICMSC: IEEE International Conference on Modeling, Simulation and Control, Cairo, Egypt, 2–4 November.

LogKCA: International Workshop on Logic and Philosophy of Knowledge, Communication and Action, Donostia, San Sebastián, Spain, 3–5 November.

MindNetwork: 2nd meeting of the Mind Network, a network for Philosophy of Mind & Cognitive Science, King's College, Cambridge, 6 November.

MICAI: 9th Mexican International Conference on Artificial Intelligence, Pachuca (near Mexico City), Mexico, 8–12 November.

Causation, Coherence, and Concepts. Themes from the Philosophy of Wolfgang Spohn: Konstanz, 11–13 November.

P-NPMW: 2nd Paris-Nancy PhilMath Workshop, Paris, 17–19 November.

AMBN: 1st International Workshop on Advanced Methodologies for Bayesian Networks, Tokyo, Japan, 18–19 November.

LENLS: Logic and Engineering of Natural Language Semantics, Tokyo, 18–19 November.

TAAI: Conference on Technologies and Applications of Artificial Intelligence, Hsinchu, Taiwan, 18–20 November 18-20.

KICS: 5th International Conference on Knowledge, Information and Creativity Support Systems, Chiang Mai, Thailand, 25–27 November.

ISDA: International Conference on Intelligent Systems Design and Applications, Cairo, Egypt, 29 November - 1 December.

December

Semantics for Robots: Utopian and Dystopian Visions in the Age of the 'Language Machine': Chicago, Illinois, USA, 2–4 December.

MINDGRAD: Warwick Graduate Conference in the Philosophy of Mind, University of Warwick, UK, 4–5 December.

CACS: International Congress on Computer Applications and Computational Science, Singapore, 4–6 December.

NIPS: 24th Annual Conference on Neural Information Processing Systems, Vancouver, B.C., Canada, 6–11 December.

From Cognitive Science and Psychology to an Empirically-informed Philosophy of Logic: Amsterdam, 7–8 December.

MIWAI: 4th Mahasarakham International Workshop on Artificial Intelligence, Mahasarakham, Thailand, 9–10 December.

APMP: 1st International Meeting of the Association for the Philosophy of Mathematical Practice, Brussels, 9–11 December.

ICDM: International Conference on Data Mining, Sydney, Australia, 13–17 December.

SILFS: International Conference of the Italian Society for Logic and Philosophy of Sciences, University of Bergamo, Italy, 15–17 December.

Scepticism and Justification: COGITO Research Centre in Philosophy, Bologna, 17–18 December.

International Conference on Recent Advances in Cognitive Science: Varanasi, India, 18–20 December.

January

LogICCC Meets India: Delhi University, India, 7–8 January.

ICLA: 4th Indian Conference on logic and its Applications, New Delhi, India, 9–11 January.

Graduate Conference in Epistemology: Miami, FL, 13–15 January.

Philosophy of Science Colloquium: Durban, SA, 18 January.
The Notion of Form in 19th and Early 20th Century Logic and Mathematics: International graduate workshop, Vrije Universiteit Amsterdam, 20–21 January.
SODA11: ACM-SIAM Symposium on Discrete Algorithms, San Francisco, California, USA, 23–25 January.
ICISD: International Conference on Intellingent Systems & Data Processing, Vallabh Vidyanagar, Gujarat, India, 24–25 January.
ICAART: 3rd International Conference on Agents and Artificial Intelligence, Rome, Italy, 28–30 January.
CCA: Computability and Complexity in Analysis, Cape Town, South Africa, 31 January - 4 February.

February

AIA: 11th International Conference on Artificial Intelligence and Applications, Innsbruck, Austria, 14–16 February.
PhDs in Logic: Graduate Conference and Winter School, Brussels, 17–18 February.

March

STACS: 28th International Symposium on Theoretical Aspects of Computer Science, Dortmund, Germany, 10–12 March.
NAFIPS: 30th North American Fuzzy Information Processing Society Annual Conference, El Paso, Texas, USA, 18–20 March.
AI and Health Communication: Stanford University, California, 21–23 March.

April

SpringSim: Spring Simulation Multi-conference, Boston, MA, USA, 4–9 April.
The Authority of Science: University of Sydney, Australia, 8–10 April.
AIML: ICGST International Conference on Artificial Intelligence and Machine Learning, Dubai United Arab Emirates, 11–14 April.
AICS: 22nd Midwest Artificial Intelligence and Cognitive Science Conference, Cincinnati, Ohio, USA, 16–17 April.
NFM: 3rd NASA Formal Methods Symposium, Pasadena, California, USA, 18–20 April.

§6
Courses and Programmes

Courses

SIPTA: 4th school of the Society for Imprecise Probability: Theories and Applications, Durham, UK, 1–6 September.
Logic or Logics?: Mini-course, Arché Research Centre, St Andrews, Scotland, 27–29 September.
BLT: Bochum-Lausanne-Tilburg Graduate School: Philosophy of Language, Mind and Science on Calculation, Intuition, and A Priori Knowledge, Tilburg University, The Netherlands, 5–8 October; Philosophy of Mind, Reduction, Neuroscience, University of Lausanne, Switzerland, 12–16 October.
SELLC: Sino-European Winter School in Logic, Language and Computation, Guangzhou, China, 3–18 December.

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.
MRes in Methods and Practices of Philosophical Research: Northern Institute of Philosophy, University of Aberdeen.
MSc in Applied Statistics and Datamining: School of Mathematics and Statistics, University of St Andrews.
MSc in Artificial Intelligence: Faculty of Engineering, University of Leeds.

MSc in Cognitive & Decision Sciences: Psychology, University College London.

MSc in Cognitive Science: University of Osnabrück, Germany.
MSc in Cognitive Psychology/Neuropsychology: School of Psychology, University of Kent.
MSc in Mathematical Logic and the Theory of Computation: Mathematics, University of Manchester.
MSc in Philosophy of Science, Technology and Society: University of Twente, The Netherlands.
Master of Science: Logic, Amsterdam.
Research Master in Cognitive Science and Humanities: Language, Communication and Organization: Institute for Logic, Cognition, Language, and Information, University of the Basque Country (DonostiaSan Sebastian).

§7
Jobs and Studentships

Jobs

Postdoctoral Research Associate: on the project "Word Segmentation from Noisy Data with Minimal Supervision", School of Informatics, University of Edinburgh, deadline 1 September.
Bertrand Russell Professorship of Philosophy: Faculty of Philosophy, University of Cambridge, deadline 10 September.
Professorship: in Mathematical Logic, Department of Mathematics, Stockholm University, deadline 15 September.
Post-Doctoral Research Fellowships: in the Humanities, Social Sciences, and Theoretical Sciences, All Souls College, University of Oxford, deadline 24 September.
Visiting International Fellowship: in social research methods for visits in calendar year 2011, Department of Sociology, University of Surrey, Guildford, UK, deadline 30 September.
Post-doc Stipend: in theoretical philosophy, Philosophy Department, Ruhr-Universität Bochum, deadline 10 October.
Tenure-track position: with specialisation in philosophy of science, Department of Philosophy, Concordia University, Montreal, Quebec, deadline 1 November.
Wagner Risk Fellowship: Center for Philosophy of Science, University of Pittsburgh, deadline 15 November.

Studentships

10 PhD student positions: within the doctoral program "Mathematical Logic in Computer Science", Vienna University of Technology (TU Wien), until filled.
PhD Studentship: "Hyper-heuristics for Grouping Problems", School of Computer Science, University of Nottingham, until filled.
PhD position: "Modelling the evolution of theory of mind", Institute of Artificial Intelligence (ALICE), University of Groningen, deadline 1 September.
PhD position: "A cognitive system supporting intelligent interaction", Institute of Artificial Intelligence (ALICE), University of Groningen, deadline 1 September.
PhD position: "Logics for higher-order social cognition", Institute of Artificial Intelligence (ALICE), University of Groningen, deadline 1 September.
PhD positions: in the programme "Foundations of the Life Sciences and Their Ethical Consequences" (FOLSATEC) at the SEMM (European School of Molecular Medicine), Milano, deadline 26 September.