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The 2007 Annual Conference of the Australasian Association for Logic took place in Melbourne, Australia, on November 9–11, 2007. The conference was organized by Greg Restall, with help from Conrad Asmus, Tama Coutts and Zach Weber, of the University of Melbourne, and Su Rogerson, of Monash University. The program consisted of contributed talks of 45 and 60 minutes in length. Abstracts of the contributed talks that were presented at the conference follow.

For the Organizing Committee
GREG RESTALL

Abstracts of contributed talks

► CONRAD ASMUS, *Paraconsistency on the rocks*.
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Can commitment to a theory of inference overflow into commitment to non-inferential theories? Specifically, does a commitment to paraconsistency (the view that the inference from a contradiction to any sentence is invalid) commit one to true contradictions? While there is no immediate reason to think so, I will show that, once we take into account the philosophy of validity, paraconsistency drives one onto the rocks of Dialetheism.

► PHILLIPPE BALBIANI, ALEXANDRU BALTAG, HANS VAN DITMARSCH, ANDREAS HERZIG, TOMOHIRO HOSHI AND TIAGO DE LIMA, *Arbitrary announcement logic*.
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Public announcement logic is an extension of multi-agent epistemic logic with dynamic operators to model the informational consequences of announcements to the entire group of agents. We propose an extension of public announcement logic, called arbitrary announcement logic, with a dynamic modal operator that expresses what is true after arbitrary announcements. Intuitively, $\Box\phi$ expresses that ϕ is true after an arbitrary announcement ψ.

For an example, let us work our way upwards from a concrete announcement. When

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an atomic proposition p is true, it becomes known by announcing it. Formally, in public announcement logic, $p \supset [p]Kp$. This is equivalent to

$$\langle p \rangle Kp$$

which stands for 'the announcement of p can be made and after that the agent knows p'. More abstractly this means that there is a announcement ψ, namely $\psi = p$, that makes the agent know p, slightly more formal:

there is a formula ψ such that $\langle \psi \rangle Kp$

We introduce a dynamic modal operator that expresses exactly that:

$$\Diamond Kp$$

Obviously, the truth of this expression depends on the model: p has to be true. In case p is false, we can achieve $\Diamond K \neg p$ instead. The formula $\Diamond(Kp \vee K\neg p)$ is valid.

[1] P. Balbiani, A. Baltag, H. P. van Ditmarsch, A. Herzig, T. Hoshi and T. De Lima, *What can we achieve by arbitrary announcements? A dynamic take on Fitch's knowability*, ***Proceedings of TARK XI*** (D. Samet, editor), Presses Universitaires de Louvain, Louvain, 2007, pp. 42–51.

► MARTIN BUNDER, *Conditions for a unique normal proof in $H_{\rightarrow}$*.
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It was known that if no atom occurs more than twice in an $\rightarrow$ formula, this can have at most one normal proof in $H_{\rightarrow}$. We show that a weaker "PNN condition" also leads to this result. Tatsuta has claimed an "even weaker" condition—a restriction on the $\rightarrow$ introduction rule. We show that neither of two natural variants of this condition is weaker than PNN. We also show how minimality relates to uniqueness of normal proof and to the three conditions above, leaving a few open questions.

► TAMA COUTTS, *Mass terms in a Davidsonian framework*.
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One part of English that has proved a stumbling block for Davidsonian semanticists is mass terms. In this paper I explain why there is a problem and explore the possibility of a novel solution: treating mass terms as quantifiers. This attempt builds on Wiggins approach to quantifiers, which he hopes will allow Davidsonians to deal with all quantifiers, obviously including, for instance, the problematic "most".

► ROD GIRLE, *Internalism and externalism in dialogue systems*.
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There are at least two quite different approaches to formal systems intended to model argumentative dialogue and interactive reasoning. One approach treats a dialogue system as yet another proof system for First-order Logic, classical or non-classical. In this view there are semantic methods such as the model search system of truth-trees, the deduction systems such as natural deduction or proof-trees, and now in addition there is formal dialogue (often linked to game theoretic-semantics for predicate logic) [2]. This approach ties the dialogue system to some logic external to the dialogue system. This is the externalism in dialogue systems.

A quite different approach treats dialogue systems as formal models of interactive reasoning without being tied to proving anything in a specific logic such as classical First-order

Logic. The systems are somewhat like formal rules for the moderation of debate. The rules are formulated to prevent petitio principii, avoiding the question, asking loaded questions and to highlight matters such as hasty generalisation, irrelevance, and other such deductive and inductive fallacious moves in argumentation about contingent matters [1]. In this approach there is an internal logic of moderation determined by the rules of the system. This is internalism in dialogue systems. We discuss the contrast between these approaches in terms of the question of the logical dependence of the former on a logic external to the formal model and of the independence of the latter. The questions arises as to whether the former is really a useful way of using dialogue systems, and as to whether dialogue systems can be truly independent of specific logics.

[1] CHARLES HAMBLIN, ***Fallacies***, Methuen, 1970.

[2] SHAHID RAHMAN and LAURENT KEIFF, *On how to be a dialogician*, ***Logic, thought and action*** (Shahid Rahman and John Symons, editors), Springer, Berlin, 2005, pp. 359–408.

► A. P. HAZEN, *"Steps" retraced.*
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Goodman and Quine's [2] is a peculiar paper, mixing metaphysics (indeed, speculative cosmology!) and detailed logical construction. Since the publication of [3] we have a picture of the intellectual background to its composition; I will try to describe its (at least historically interesting) mathematical content. Motivated by the desire for an instrumentalistic account of classical mathematics, a central goal is the definition of such notions as formula and theorem in a language referring only to a finite corpus of concrete inscriptions. By results of [4], First Order Logic is insufficient for this: [2] makes use of monadic Second Order Logic (proxied by the Calculus of Individuals). By results of [1], monadic Second Order Logic is insufficient: [2] makes use of an equinumerosity quantifier.

[1] J. R. BÜCHI, *Weak second-order arithmetic and finite automata*, ***Zeitschrift für mathematische Logik und Grundlagen der Mathematik***, vol. 6 (1960), pp. 66–92.

[2] NELSON GOODMAN and W. V. QUINE, *Steps toward a constructive nominalism*, ***The Journal of Symbolic Logic***, vol. 12 (1947), no. 4, pp. 105–122.

[3] PAOLO MANCOSU, *Harvard 1940—Tarski, Canap and Quine on a finitistic language of mathematics for science*, ***History and Philosophy of Logic***, vol. 26 (2005), pp. 327–357.

[4] ROBERT MCNAUGHTON and SEYMOUR PAPERT, ***Counter-free automata***, MIT Press, Cambridge, 1971.

► TOMASZ KOWALSKI AND JOHN K. SLANEY, *A finite fragment of S3*.
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Meyer [2] raises the question of the number of distinct (non-equivalent) formulae in one variable in the relevant logic $\mathbf{E}_{\to}$, while answering it for the stronger logic $\mathbf{R}_{\to}$. The answer in the latter case is 6, while in the former case it is still not known whether the number is finite or infinite—the latest count, produced by brute force enumeration, stands at over 6 million. Over the last four decades, several related results have appeared. $\mathbf{S4}_{\to}$, the pure (strict) implication fragment of the modal logic **S4**, has exactly 9 non-equivalent formulae in one variable [1], while the fragment of **E** with both implication and negation has infinitely many zero-variable formulae built up from the sentential constant f [3]. A little weaker than $\mathbf{E}_{\to}$ is $\mathbf{T}_{\to}$, for which the question is also open, and between $\mathbf{E}_{\to}$ and $\mathbf{S4}_{\to}$ lies the non-normal modal logic $\mathbf{S3}_{\to}$. The purpose of the present paper is to investigate the one-variable fragment of $\mathbf{S3}_{\to}$. We show that the free $\mathbf{S3}_{\to}$ algebra with one generator is finite, and thus that there are only finitely many non-equivalent formulae in $\mathbf{S3}_{\rightarrow}$. The exact number of these formulae is not known. We then examine the two-variable fragment of **S4**, showing that it is infinite and therefore that finiteness does not extend beyond the one-variable case.

[1] MICHAEL BYRD, *Single variable formulas in S4*$_{\rightarrow}$, ***Journal of Philosophical Logic***, vol. 5 (1976), no. 4, pp. 439–456.

[2] ROBERT K. MEYER, R_I*—the bounds of finitude*, ***Zeitschrift für mathematische Logic und Grundlagen der Mathematik***, vol. 26 (1970), pp. 385–387.

[3] JOHN K. SLANEY, *Sentential constants in systems near R*, ***Studia Logica***, vol. 52 (1993), no. 3, pp. 443–455.

► ROBERT K. MEYER, *A logic for Leibniz's God.*
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According to G. W. Leibniz, God created this best of all possible worlds. (Those who doubt it should check out some of the worlds that God did NOT create!) Of course it was not a logical question which world God would create. But we can ask ourselves as logicians, "Which are the possible worlds among which God chooses?" And we might ask ourselves the further question, "What Logic did God invoke in making his choice?"

It stands to Reason that God, being All Perfect, preferred a Relevant Logic—one that takes seriously the Real Relations in the world, including the real relations that must obtain between premises and conclusion in a valid argument. Yet God, surely, is no Relevantist, in the sense of A. R. Anderson, N. D. Belnap and J. M. Dunn. For how could he share the Relevantist disdain for Boolean negation? Since as C. S. Peirce insisted Truth is what comes to be believed in the Long Run, who is better than God in working that out? In particular if the proposition A fails to be destined for Long Run success, then God has chosen the Boolean negation $\neg A$ of A. All of Aristotle's famous Laws of Thought will of course HOLD for God—Identity, Non-contradiction, Excluded Middle.

And there need be no Relevantist nonsense about the failure of disjunctive syllogism. If $\neg A \vee B$ is Long Run OK, then at least one of $\neg A$, B has this property. And, if A also is Long Run OK, it can't by Non-contradiction be $\neg A$ that passes divine muster; so it must in this case be B. Meanwhile we CANNOT require of God that he should choose WHICH relevant logic his rational creatures should come to prefer. True theology has always made a good deal of human freedom.

It follows that God himself no doubt opted for a minimal classical relevant logic; the system **CB** comes immediately to mind. For **CB** is the logic based on absolutely no semantical postulates, save that there is a ternary relation **R** on possible worlds which gives rise to the truths of Logic. If, on the other hand, God's creatures prefer some stronger and more vertebrate Logic like **CR**, all they need do is to impose some specific postulates on ternary R—among others that this R is totally reflexive, in the sense that $Raaa$ holds for all possible worlds a.

Still, we wish in this paper to go behind the specifics of logics like **CR** and to investigate rather the Key to the Universe that God made. This Key lies in **CB**. Already in the early days of relevant semantics, in which the author participated with R. Routley from 1971 on, it was clear that the shape of ternary semantical postulates reflected the combinators that H. B. Curry had associated with specific intuitionistically valid implicational formulas. In fact, the situation is better than that, since there are postulates (such as total reflexivity $Raaa$) that correspond to formulas involving both $\rightarrow$ and ordinary $\wedge$. (This extends the Curry correspondence, along lines developed in the intersection type theory of M. Coppo and M. Dezani-Ciancaglini and their colleagues.)

But the correspondence is only perfected when we go all the way to **CB**, introducing both Boolean $\neg$ and ordinary disjunction $\vee$, as I shall show in this talk.

► CHRIS MORTENSEN, *Linear algebra representation of inconsistent and incomplete Necker cubes*.
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Following an earlier paper [1] in the which described nontrivial inconsistent theories and Necker-cube representations thereof, I apply linear algebra over $\mathbb{Z}/2$ to reach, through a series of approximations, necessary and sufficient conditions for such theories to be inconsistent, either locally or globally. I also find an application for the Routley $*$ Functor, which turns out to commute with linear algebraic operations.

[1] CHRIS MORTENSEN, *An analysis of inconsistent and incomplete Necker cubes*, ***Australasian Journal of Logic*** vol. 5 (2006), pp. 216–225.
URL Address: `http://www.philosophy.unimelb.edu.au/ajl/2006.`.

► GREG RESTALL, *Truth values and proofs*.
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If you define validity in terms of the preservation of truth, and if a proof is a special kind of structure presenting a valid argument from premises to conclusions, then the connection between truth and proof is clear. If, on the other hand, you define validity without appealing to the notion of truth in giving this definition — whether as a verificationist, intuitionist, or some other kind of inferentialist — then the onus is on you to explain the connection, if any, between proof and truth. In "Multiple Conclusions" [1] I present this kind of analysis of the sequent calculus for classical logic.

In this talk, I consider three different criteria we want truth values to meet, and I show how, given a sequent calculus, we can construct things which meet exactly those criteria.

[1] GREG RESTALL, *Multiple Conclusions*, ***Logic, Methodology and Philosophy of Science: Proceedings of the Twelfth International Congress*** (Petr Hájek, Luis Valdés-Villanueva and Dag Westerståhl, editors), KCL Publications, London, 2005, pp. 189–205.

► PENELOPE RUSH AND ROSS BRADY, *What is wrong with truth-functional semantics*?
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Deductive Logic is primarily about deduction, which is embraced in formal deductive systems. In these systems, for a formula A, exactly one of A and its negation $\sim A$ can occur or both can occur or neither of them, independently of whether the system is classically-based or not. To cater for these possibilities, their semantics should then be, at base, 4-valued. Further, in analysing logical arguments, meanings must be taken into account and a proper semantics should reflect these meanings. We set up a content semantics to do this and see that the logic MC of meaning containment is sound and complete with respect to it. We also see that key non-theorems are rejected by the semantics, thus pinning down the logic MC. This semantics is thereby doing the appropriate semantical job. As can be seen from its canonical modelling, it is close to the deductive system, yielding the above 4-values.

Truth-functional semantics, on the other hand, is more distant from the deductive system. It primarily involves truth rather than meaning and is often 2-valued rather than 4-valued. Whilst truth-preservation provides much of the raison d'etre for logic, deductive logic applies to deductions generally and in particular to contexts where the sentences may largely be false.

Truth-functional semantics generally requires a Henkin-style formula-feed construction for its canonical modelling, starting with a set of formulae which is deductively based.

The completeness that is thereby established holds for most pure logics and can fail for applied logics. Truth-functional semantics is nevertheless technically useful in determining validity and invalidity of formulae, especially in the pure logic, conservative extension results, decidability, etc.

► HARTLEY SLATER, *Paradoxes and pragmatics*.
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It is shown that Tarski's assessment that natural language is inconsistent on account of the Liar Paradox is incorrect. Partly his assessment was based on ignorance of propositions and their grammatical expression, as Kneale showed. But also it arose through blindness to pragmatic factors in language. That blindness was common in his time, and it has continued to the present day, in discussions of 'Open Pairs', and Yablo-type paradoxes, for instance. All this bears on the possibility of natural language analogues of the Fixed Point Theorem: what Tarski's Theorem in fact shows is that Truth is not a property of sentences, as Kneale again pointed out.

► ZACH WEBER, *Life without disjunctive syllogism: techniques for coping in an inconsistent world*.
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In paraconsistent logics, the inference of disjunctive syllogism is invalid. Using applied examples, I discuss the role of disjunctive syllogism (material detachment) in mathematical proofs, and the impact of rejecting it. Many classical proofs for otherwise paraconsistently acceptable theorems make seemingly essential use of material detachment; but in fact in most cases an alternative, non-classical proof is available. I offer a few strategies for finding such proofs.