—Provisional Timetable—
WCP4: The Fourth World Congress of Paraconsistency

Ormond College
The University of Melbourne
July 13 to 18, 2008

Timetable

Sunday the 13th of July

Registration and Opening

Time	Event	Place
4 – 7	Registration	JCR
7.30 – 9	Opening Address: MARK COLYVAN *The Ontological Commitments of Inconsistent Theories*	JCR
9 – 10.30	Reception	TBA

Key: JCR = Junior Common Room

Monday the 14th of July

Registration

Time	Event	Place
8 – 9	Registration	JCR
12.25 – 1.15	Registration	JCR

Time	JCR	Kaye Scott Room
First Plenary 9–10	JOKE MEHEUS *An Adaptive Logic for Normative Conflicts*	
10–10.20	Morning Tea	
Talk 1 10.20–11.20	PATRICK ALLO *Paraconsistency and the logic of ambiguous connectives*	MIKE ANDERSON, WALID GOMAA, JOHN GRANT AND DON PERLIS *What Can We Learn From Human Paraconsistency?*
Talk 2 11.25–12.25	F. G. ASENJO *Vicious Circles: Formalizing Antinomic Terms*	
12.25–1.15	Lunch	
Talk 3 1.15–2.15	JOSEPH BRENNER *Paraconsistency and Transconsistency: The Ontological Turn*	WITOLD WISZNIEWSKI *Can a theory of imaginary numbers be based on contradiction?*
Talk 4 2.20–3.20	HITOSHI OMORI AND TOSHIHARU WARAGAI *Some New Results on PCL1 and its Related Systems*	CARLOS CALEIRO AND RICARDO GONÇALVES *Behavioral Algebraization of the $\mathcal{C}_n$ Systems of da Costa*
3.20–3.50	Afternoon Tea	
Talk 5 3.50–4.50	DIDERIK BATENS *New arguments for adaptive logics as unifying frame for the defeasible handling of inconsistency*	JEAN-YVES BÉZIAU *The World of Paraconsistency*
Talk 6 4.55–5.55	FRODE BJØRDAL *Cantor's Arguments Resisted*	ROSS T. BRADY AND ANDREA MEINANDER *Distribution in the Logic of Meaning Containment and in Quantum Mechanics*
Second Plenary 6–7	WALTER CARNIELLI AND MARCELO E. CONIGLIO *On discourses addressed by infidel logicians*	

Tuesday the 15th of July

Time	JCR	Kaye Scott Room
First Plenary 9–10	MAREK NASIENIEWSKI AND ANDRZEJ PIETRUSZCZAK *On modal logics defining Jaśkowski's* D_2*-consequence*	
10–10.20	Morning Tea	
Talk 1 10.20–11.20	ALEXANDRE COSTA LEITE *Paraconsistentization of Logics*	JEREMY SELIGMAN *Unbounded Incoherence*
Talk 2 11.25–12.25	JAMES CHASE *Voting and Vagueness*	JEAN PAUL VAN BENDEGEM *Inconsistent roads to classical mathematical theories*
12.25–1.15	Lunch	
Talk 3 1.15–2.15	EVANDRO LUÍS GOMES *Paraconsistency in Aristotle's theory of syllogism*	MICHELLE FRIEND *Pluralism and "Bad" Mathematical Theories: Challenging our Prejudices*
Talk 4 2.20–3.20	CHRIS MORTENSEN, PETER QUIGLEY AND SEVE LEISHMAN *The Impossible University*	ALESSIO MORETTI *New light on the Priest-Slater-Béziau debate on the hidden geometry of paraconsistency*
3.20–3.50	Afternoon Tea	
Talk 5 3.50–4.50	ROBERT K. MEYER AND CHUNLAI ZHOU *Less is More: A Classical Relevantist Tale*	HANS LYCKE *Modal Inconsistency–Adaptive Logics*
Talk 6 4.55–5.55	DAGMAR PROVIJN *Paraconsistency and relevance in abductive reasoning*	JOÃO MARCOS *Logics of Formal Inconsistency*
Second Plenary 6–7	BRYSON BROWN AND GRAHAM PRIEST *Chunk and Permeate II: Weak aggregation, permeation and old quantum theory*	

Wednesday the 16th of July

Wine Trip

Time	Event	Place
TBA	Wine Trip	TBA

Thursday the 17th of July

Time	JCR	Kaye Scott Room
First Plenary 9–10	Edwin D. Mares *Information, Truth, and Negation*	
10–10.20	Morning Tea	
Talk 1 10.20–11.20	Graham Priest *Inclosures, Vagueness and Self-Reference*	Giuseppe Primiero *A model for processing updates with inconsistent information*
Talk 2 11.25–12.25	Gillman Payette *Paraconsistent Logics, Paraconsistent Inference and Logical Pluralism*	Zach Weber *Transfinite Numbers in Paraconsistent Set Theory*
12.25–1.15	Lunch	
Talk 3 1.15–2.15	Chris Mortensen *Merge, Chunk and Permeate*	Umberto Rivieccio *Neutrosophic Logics*
Talk 4 2.20–3.20	Greg Restall *Assertion, Denial, Negation and Paraconsistency*	Andreas Pietz *Dual Intuitionistic Logic and Faultless Disagreement*
3.20–3.50	Afternoon Tea	
Talk 5 3.50–4.50	Paul Wong *Minimizing Disjunctive Information*	Christian Strasser *An Adaptive Logic for Conditional Obligations and Deontic Dilemmas*
Talk 6 4.55–5.55	Dunja Šešelja *Strengthened Rescher-Manor Consequence Relations as CLuN-based Adaptive Logics*	Hartley Slater *Paraconsistent Graphs*
Second Plenary 6–7	Francesco Paoli *A Paraconsistent and Substructural Conditional Logic*	

Friday the 18th of July

Time	JCR	Kaye Scott Room
First Plenary 9–10	FRANCESCO BERTO *The Gödel Paradox and Wittgenstein's Reasons*	
10–10.20	Morning Tea	
Talk 1 10.20–11.20	PETER SCHOTCH *Everything you wanted to know about the preservationist approach to paraconsistency, if only you'd known there was such a thing*	JC BEALL *A Philosophical Interpretation of 'Weak* LP*'*
Talk 2 11.25–12.25	KOJI TANAKA *Making Sense of Paraconsistent Logic – The Nature of Logic, Classical Logic and Paraconsistent Logic*	FABIEN SCHANG *Can there be "truth-and-false-makers"?*
12.25–1.15	Lunch	
Talk 3 1.15–2.15	DAVID SWEENEY *Does the infinitesimal calculus C&P?*	PETER VERDÉE *Predicative* $\mathbf{CL}^{-}$*: a good paraconsistent alternative to classical logic*
Talk 4 2.20–3.20	DAVID RIPLEY *Sorting out the Sorites*	IRA KIOURTI *Modal Realism, Impossible Worlds, and Paraconsistency*
3.20–3.50	Afternoon Tea	
Talk 5 3.50–4.50	ELIA ZARDINI *Bradwardine's Theorem in a Relevant Framework*	BEN BURGIS *Paraconsistent Tense Logic, the Metaphysics of Change and the Epistemic Consequences of Dialethesim*
5	Open Forum	

Conference Dinner

Time	Event	Place
7	Predinner Drinks	TBA
TBA	Conference Dinner	TBA

Abstracts

Patrick Allo, *Paraconsistency and the logic of ambiguous connectives.*
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Non-dialetheic proponents of paraconsistency have often appealed to ambiguity to explain away the apparent acceptance of true contradictions in their paraconsistent approach to logical consequence. This can be done by referring to an ambiguity at the level of the logical or the non-logical vocabulary. The kind of ambiguity I'm interested in, relates the validity of explosion to the ambiguity of the classical connectives. (see e.g. [3]).

While this is all fairly well known, it is generally not remarked that classical logic offers only one of two intuitively plausible ambiguous readings of the logical connectives. Namely, a reading which takes an ambiguous connective to exhibit the deductive features of the extensional *and* intensional connectives. Another option, however, takes each ambiguous connective that plays a role in an argument to exhibit (in a non-deterministic way) the deductive features of either an intensional or an extensional connective. Call this the equivocal reading. To be precise, where $\mathtt{tr}_e : \mathsf{FORM} \mapsto \mathsf{FORM}^{\mathsf{amb}}$ (a surjective mapping from a language containing extensional and intensional connectives to an ambiguous language), a consequence relation on the ambiguous language $\mathsf{FORM}^{\mathsf{amb}}$ can be defined as follows: Where $\Gamma \cup \{A\} \subseteq \mathsf{FORM}^{\mathsf{amb}}$, $\Gamma \vdash_{amb} A$ iff for each $\Gamma' \subseteq \mathsf{FORM}$ which contains for each $B \in \Gamma$ a B' such that $\mathtt{tr}_e(B') = B$, there is an A' that satisfies $\mathtt{tr}_e(A') = A$ *and* $\Gamma' \vdash A'$. For instance, we say that $A \texttt{ OR } B, \texttt{NOT} - A \nvdash_{amb} B$ in virtue of $A \sqcup B, \sim A \nvdash B$ and despite $A \oplus B, \sim A \vdash B$; or that $\vdash_{amb} A \texttt{ OR NOT} - A$ holds solely in virtue of the validity of $A \oplus \sim A$.

This consequence relation seems to be interesting in its own right. Most importantly, it turns out that a slight modification of the above definition yields a logic which is a close sibling of the prototypical dialetheic logic **LP**. The first aim of the investigation of this newly defined consequence relation, is to clarify the connection between the equivocal reading of a *logic of ambiguous connectives* and the *logic of paradox*. The second aim is to explore the consequences of the definability of such a logic for the position of the non-dialetheic paraconsistent logician. That such a logic affects the non-dialetheist position seems inevitable, since if (contra [1]) one denies that the difference between intensional and extensional connectives is purely epistemic, inferential contexts where one cannot discriminate between these two classes of connectives should not be excluded. Combined with the demand that logic should provide a safe guide to inference that only requires one to pay attention to the premises ([2]), it follows that the non-dialetheist has no obvious reason to dismiss a logic for ambiguous connectives like the one just presented.

[1] Burgess, J. P., *Relevance: A Fallacy?*, ***Notre Dame Journal of Formal Logic***, 22(2): 97–104, 1981.

[2] Priest, G., *Logic: One or Many?*, ***Logical Consequence: Rival Approaches***, (J. Woods and B. Brown, editors), Hermes, Stanmore: 23–38, 2001.

[3] Read, S., *What is Wrong with Disjunctive Syllogism?*, ***Analysis***, 41: 66–70, 1981.

Mike Anderson, Walid Gomaa, John Grant and Don Perlis, *What Can We Learn From Human Paraconsistency?*.
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Human logic is paraconsistent. People do not continue blithely reasoning in the face of "P & ¬P" but rather notice the conflict and respond. This makes contradictions useful: they are important clues to something amiss, perhaps a faulty sensor, a misunderstood expression, or deceit. In fact, everyday experience is an abundant source of inconsistencies, and these must be well-managed to survive. Told both "it is cold" and "it is not cold" we would conclude that something is wrong: one of these statements is false; or there are ambiguities in meaning (different senses of cold, or of location, or of time); or noisehas distorted the input ("it is not gold").

But what sort of paraconsistent logic is human logic? We contend that there are a few fairly simple characteristics of human logic, that thesecan be studied formally, and that they are suitable both for modeling human reasoning and for use by autonomous robots. We have been at work on a family of such logics — so-called "active logics". Perhaps the most salient distinction of active logics is a representation of the ongoing passage of time *during* reasoning. This evolving-time feature is the key to explosion-avoidance, via a self-adjustment process hinted at in the cold-gold example above (meta-reference, and subsequent modification, to statements and their meanings).

In this paper we will describe this work (formal aspects, temporal issues, inconsistency resolution, semantics, and applications), and compare and contrast it with other approaches to paraconsistency and to formal modeling of human-level reasoning.

[1] M. L. Anderson, W. Gomaa, J. Grant and D. Perlis, *Active logic semantics for a single agent in a static world*, ***Artificial Intelligence***, (in press).

[2] M. L. Anderson, S. Fults, D. P. Josyula, T. Oates, D. Perlis, M. D. Schmill and S. Wilson, *A self-help guide for autonomous systems*, ***AI Magazine***, (in press).

[3] M. L. Anderson, M. D. Schmill, T. Oates, D. Perlis, D. P. Josyula, D. Wright and S. Wilson, *Toward domain-neutral, human-level metacognition*, ***Proceedings of the 8th International Symposium on Logical Formalization of Commonsense Reasoning***, AAAI Press (oral presentation).

[4] M. L. Anderson and D. R. Perlis, *Logic, self-awareness and self-improvement: The metacognitive loop and the problem of brittleness*, ***Journal of Logic and Computation*** (2005) 15(1): 21–40.

F. G. Asenjo, *Vicious Circles: Formalizing Antinomic Terms.*
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Antinomicity does not necessarily depend on negation; the conjunction of any sentence with any other sentence whose meaning is in opposition with that of the first one results in an antinomy. But opposition goes deeper than that, it can affect and radically change the terms themselves that are the subject of a sentence, as well as the predicates that complete the sentence. In other words, terms and predicates can become intrinsically antinomic in a way that must be distinguished from the antinomicity of sentences. Such is the case in particular for terms that become part of a vicious circle that involves opposition. Vicious circles occur unequivocally when we define a concept T in terms of another concept T', and then define T' in terms of T. Although this is generally considered a semantic blunder to be avoided, such circles are in effect inevitable at the beginning of every system of thought. To define in order to understand a primitive idea is impossible without circularity. Consequently, circularity should be seen as a positive logical instrument without which categories for example cannot be properly grasped. Let us call antinomic term a circle that involves opposition. "One," for instance, is always "one of many," that is, a component of the irreducible complex "one-and-many." In turn, "many" is always "many ones." This work formalizes antinomic terms and predicates within the framework of an expanded antinomic logic.

Diderik Batens, *New arguments for adaptive logics as unifying frame for the defeasible handling of inconsistency.*
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Nearly all popular reasoning forms that handle inconsistencies in a defeasible way have been characterized in terms of inconsistency-adaptive logics (IAL). All these adaptive logics are in 'standard format', which makes them particularly handy. This suggests that IAL form a suitable unifying framework for handling such reasoning forms.

I shall present four new arguments in favour of this suggestion. (i) Identifying equivalent premise sets proceeds along familiar lines and is much easier than for many other formats. (ii) Characterization in terms of IAL offers easy extensions and variations (a fascinating new type of example will be given). (iii) IAL offer parsimonious axiomatizations of theories (often finite where other formats require infinite ones). (iv) IAL offer maximally consistent interpretations by themselves, without requiring tinkering from their user.

If time remains, I shall decisively answer the recently published claim that IAL are too complex for human users.

JC Beall, *A Philosophical Interpretation of 'Weak LP'.*
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Weak Kleene (WK) and Strong Kleene (SK) have perfectly sensible – and familiar – philosophical interpretations, namely, 'meaninglessness' and 'undefined' or 'indeterminate', respectively. What of the dual paraconsistent matrices, namely, Strong LP (LP) and Weak LP (WLP)? The former has a perfectly good – and familiar – philosophical interpretation, namely, 'true and false'. What of the latter? While probably not much turns on the issue, the question is interesting and, as far as I know, not much has been said on the matter. What philosophical interpretation of WLP is natural? I suggest an answer: namely, 'overly meaningful (e..g, ambiguous) and partly true'. This is supposed to be the 'dual' (in a very loose sense) of WK's philosophical interpretation. Here, there are two things to motivate: 1) the failure of Simplification; and 2) the designation of the middle value. Thinking of the middle value as something like *many propositions at least one of which is true* does the trick. The *many propositions* part motivates (1), and the *at least one of which is true* motivates (2) – or so I suggest in this talk.

Francesco Berto, *The Gödel Paradox and Wittgenstein's Reasons.*
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I provide an interpretation of Wittgenstein's much criticized remarks on Gödel's First Incompleteness Theorem in the light of paraconsistent arithmetics: in taking Gödel's proof as a paradoxical derivation, Wittgenstein was right, given his deliberate rejection of the standard distinction between theory and metatheory. The reasoning behind the proof of the truth of the Gödel sentence is then performed within the formal system itself, which turns out to be inconsistent.

I show that the models of paraconsistent arithmetics (obtained via the Meyer-Mortensen collapsing filter on the standard model) match with many intuitions underlying Wittgensteins philosophy of mathematics, such as its strict finitism and the insistence on the decidability of any meaningful mathematical question.

Jean-Yves Béziau, *The World of Paraconsistency.*
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In this talk I will presnt the various tendencies of paraconsistency: the many systems of paraconsistent logics and tools to develop paraconsistency and the many ways to interpret contradictions.

Frode Bjørdal, *Cantor's Arguments Resisted.*
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The system called "liberalism", denoted by ל ("lamed"), is based upon a departure system ד ("dalet"). Both systems use a standard language of set theory extended with a truth-operator, and a liberal comprehension principle, LCP, of the form

$$(\forall x)(x \in \{y : A(y)\} \leftrightarrow \text{True } A(x))$$

is invoked. LCP will be sensitive to the logic of the truth-operator. ד is defined relative to a model using a revisionary style semantics. ל is obtained using an impredicative construction, ensuring

CP1 ל proves p iff ד proves not-True not-p

CP2 (ל proves p, and it is not the case that ל proves not p) iff ד proves True p

ל extends classical logic in that all theorloems of classical logic remain theorems of ל, and no theorem of ל contradicts classical logic. Still, ל is a paraconsistent system in that for some p, both p and not-p are theorems. Importantly, modus ponens is not a generally valid inference rule in ל. Instead, the connexion principles CP1 and CP2 induce eight other valid inference rules for ל, as modus ponens holds for ד. In these inference rules for ל, both the theoremhood and the non theoremhood of formulas are invoked. The talk will focus upon how the existence of a paradoxical topology undermines the first of Cantors arguments for the uncountability of the reals, and how the existence of paradoxical functions undermines Cantor's second argument for the higher cardinality of power sets of infinite sets.

Ross T. Brady and Andrea Meinander, *Distribution in the Logic of Meaning Containment and in Quantum Mechanics.*
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One of the main systemic groupings of paraconsistent logics is that of relevant logic. The logic MC of meaning containment stands out amongst the relevant logics as being conceptualised by a specific content semantics, which can be used to more-or-less pin down the axiomatization to this logic MC. There has been some concern, however, as to whether the distribution axiom should belong to the logic MC or not and, if not, what forms distribution should take. This also raises the issue of the appropriate forms for quantified distribution in the logic MC(Q) of quantified meaning containment.

To deal with these issues, this paper will first examine distribution from the following proof-theoretic and semantic perspectives.

1. Fitch-style normalised natural deduction system for MC(Q).

2. Gentzen sequent calculus for MC(Q).

3. Schroeder-Heister's proof-theoretic semantics.

4. Content semantics for MC(Q).

5. Truth-functional semantics for MC(Q).

6. Venn diagrams.

The issue of distribution also arises in the context of quantum mechanics. To this end, we examine the following three alternative logical accounts.

1. Classical logic.

2. Quantum logic.

3. Reichenbach's three-valued logics.

We then discuss which of these is preferable and the impact of this on distribution.

Finally, taking all this into account, we make the appropriate adjustments to the logics MC and MC(Q).

Joseph Brenner, *Paraconsistency and Transconsistency: The Ontological Turn.*
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In his 1987 monograph [1], Priest defined as transconsistent the "realm beyond the consistent". However, his logics have since been subsumed under the term paraconsistent, and transconsistency is little used in logic [2]. Priest later [3] called attention to a generalized ontological turn in philosophy, away from language and toward what is—the nature of reality—and suggested that that nature is contradictory.

I describe, in detail elsewhere [4], a non-propositional extension of logic (logic in reality, LIR) to real phenomena, processes and entities that is grounded in the fundamental dualities in nature at the quantum and cosmological levels. These dualities and self-dualities instantiate a principle of dynamic opposition (PDO) that translates into real contradictions (or counter-actions) at biological, cognitive and social levels.

The term "transconsistent" is thus appropriate for LIR because it extends logic beyond the consistency and inconsistency handled by paraconsistent logics. This includes paraconsistent logics that make ontological commitments, such as those of Priest, and those of Carnielli [5] that do not. It is thus not captured by the universal logic of He [6] or Béziau. The grounding of LIR and its associated categorial ontology in physics make possible logical inferences about the dynamics of real processes, with potential consequences for the philosophy of logic. The PDO is a metalogical and metaphysical principle that provides an additional logical, non-mathematical element of structure to the description of change, determinism and individuality.

LIR is thus proposed as a transconsistent extension of paraconsistent logic to real phenomena in the context of the ontological turn in philosophy. Examples are given of recent applications of LIR to aspects of both science and realist theories of science such as ontic structural realism.

[1] Graham Priest, *In Contradiction*, Martinus Nijhoff Publishers, Dordrecht, 1987.

[2] Jean-Yves Béziau, *From Paraconsistent Logic to Universal Logic*, ***Sorites***, 12: 5-32, 2001.

[3] Graham Priest, *Beyond the Limits of Thought*, Clarendon Press, Oxford, 2002.

[4] Joseph E. Brenner, *Logic in Reality*, Springer, Dordrecht, 2008.

[5] Walter Carnielli, *Logics of Formal Inconsistency*, ***CLE e-Prints***, State University of Campinas Campinas, Brazil, 2005.

[6] Hua-can He, *Philosophy Significance of Universal Logic*, Preprint, Montreux Congress on Universal Logic, Montreux, 2005

Bryson Brown and Graham Priest, *Chunk and Permeate II: Weak aggregation, permeation and old quantum theory.*
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Niels Bohr imposes some logical limitations on the account of the hydrogen atom first presented in Bohr (1913). Three kinds of processes are involved in his account–electromagnetic radiation, the stationary states of the atoms and changes in state for the atoms. Electromagnetic radiation is treated using classical electrodynamics, the stationary states are treated using classical mechanics and the changes in state are not described at all except in terms of their initial and final stationary states. This selective application of theoretical principles invites a weakly aggregative logical treatment of Bohr's theory, as Brown (1993) argued.

The central concept in these logics is that of the *level* of a set of sentences Γ, written $\ell(\Gamma)$. Level is a measure of *incoherence*, that is, a measure of how far a set is from consistency, based on how much division is required to separate the inconsistencies in Γ from each other. Given a base consequence relation that is monotonic, transitive and reflexive, preserving level instead of consistency produces a consequence relation is transitive, reflexive and *conditionally* monotonic, that is, monotonic with respect to extensions of premise sets that are level-preserving.[1] Weakly aggregative logics of this type can make sense of the contents of Bohr's model of the hydrogen atom. However, they are too weak to explain how *reasoning* in Bohr's model proceeded.

In this paper we apply the 'chunk and permeate' (C&P) approach (Priest and Brown, 2004) to Bohr's account of the hydrogen atom. C&P begins by fixing on a single covering family for a given premise set. In choosing such a single covering family we adopt aggregative results that go beyond general rules of aggregation at the sentential level, but in many applications it is clear that something close to a unique covering is assumed. C&P then adds a further form of restricted aggregation, in which specified *kinds* of sentences derived in certain elements of a covering are allowed to *permeate* into other elements of the covering, where further consequences are derived. The result is an intuitively appealing and straightforward picture of how reasoning with such theories proceeds.

In its initial form, C&P models inferences that 'finish', i.e. produce consequences, in one element of the chosen covering family. We close this paper with a discussion of a more general approach to C&P reasoning which allows consequences of interest to be derived in different elements of the covering family, applying the results to a broader account of reasoning within old quantum theory.

[1]The notion of level is due to P.K. Scotch and R.E. Jennings- see their (1989)

[1] Graham Priest and Bryson Brown, *Chunk and Permeate*, ***Journal of Philosophical Logic*** 33, 2004 pp. 242-263.

[2] R. E. Jennings and P. K. Scotch, *On Detonating*, ***Paraconsistent Logic: Essays on the Inconsistent*** (Richard Routley, Graham Priest and Jean Norman, editors), Philosophia Verlag, München, 1989, pp. 306–327.

[3] R. E. Jennings and P. K. Scotch *Inference and Necessity*, ***Journal of Philosophical Logic*** 9, pp. 327-340.

Ben Burgis, *Paraconsistent Tense Logic, the Metaphysics of Change and the Epistemic Consequences of Dialethesim.*
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Graham Priest has argued that there are some true contradictions, but that the statistical frequency of true contradictions is very low, and that as such the epistemic probability of any particular contradiction being true is very low. This claim is essential to his justification for the 'classical re-capture.' At the same time Priest has identified some concrete extra-semantic candidates for the status of true contradictions in analysis of the metaphysics of change. Expressed in terms of a paraconsistent logic (his own LP) outfitted with tense operators like P, which can be read as 'it was the case that,' Priest argues for "Zeno's Law," the principle that $(\alpha \,\&\, \mathsf{P}\neg\alpha)$ entails the disjunction of $(\alpha \,\&\, \neg\alpha)$ or $\mathsf{P}(\alpha \,\&\, \neg\alpha)$. Despite his repeated claims to the contrary, it will become clear that Priest is so deeply committed to the tensed theory of time that his analysis falls apart once the tenseless theory is substituted. More importantly, Priest's argument for "Zeno's Law" exhibits a methodology which undermines his claim that the statistical frequency of true contradictions is very low. A closer examination of this point should demonstrate that there is no good reason why arguments at least as good in more mundane contexts couldnt turn up enough true contradictions to overturn the claim that the statistical frequency of true contradictions is very low. As such, if dialetheism is correct, we are not justified in generally assigning low epistemic probabilities to contradictory outcomes in our arguments, and the 'classical re-capture' fails.

JAMES CHASE, *Voting and Vagueness.*
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How to handle vagueness? One way is to introduce the machinery of acceptable sharpenings, and reinterpret truth as truth-in-all-sharpenings (supervaluationism) or truth-in-some-sharpenings (subvaluationism). A major selling point has been the conservativism of the resulting systems with respect to classical theoremhood and inference. However, the philosophical story behind each of these moves is less principled. Subvaluationism, in particular, comes with a standard story (due to Stanislaw Jaskowski) that is difficult to sign up to.

In this paper, I try to make progress on this point by making use of a variant of Putnam's well-known idea of linguistic deference and some results in voting theory. The basic idea is that each member of a linguistic community gets to vote for one or more acceptable sharpenings, and truth is truth-in-a-(contextually-determined)-sufficiency-of-sharpenings. This produces a family of logical systems that are close relations of subvaluationism, share its conservatism results, yet have stronger philosophical foundations in the workings of externalist content.

MARK COLYVAN, *The Ontological Commitments of Inconsistent Theories.*
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In this paper I will present an argument for realism about inconsistent objects. The argument relies on (i) a particular, plausible version of scientific realism, (ii) classical logic and (iii) the fact that often our best scientific theories are inconsistent. It is not clear what we should make of this argument. Is the argument a reductio of the use of classical logic, at least in metaphysics? Is it a reductio of the version of scientific realism under consideration? In either case, what are the alternatives? Should we just buy the conclusion? I will argue that although moving to a paraconsistent logic reduces the number unpalatable conclusions, it does not avoid commitment to at least some inconsistent objects.

WALTER CARNIELLI AND MARCELO E. CONIGLIO, *On discourses addressed by infidel logicians.*
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In his well-known invective, the Bishop Berkeley strives to reveal contradictions in the infinitesimal calculus, perplexed by the "evanescent increments" that are neither finite nor infinitely small quantities (and "nor yet nothing", merely "ghosts of departed quantities"); in a series of queries ([1], Section XLIX) Berkeley asks (Question 64):

> "...Whether [mathematicians] do not submit to authority, take things upon trust, and believe points inconceivable? Whether they have not their mysteries, and what is more, their repugnancies and contradictions?"

Paraconsistent negations, mainly the negations supported by the LFI's, raise some perplexities of an analogous sort, as some people fail to see a central point which supports the whole analysis: how is it possible that A and $\neg A$ can be simultaneously held as true (and be not explosive) given that the "consistency" of A is untrue, and to be explosive otherwise? How can something and its negation be true and consistent? Is not inherent in the nature of consistency to require that anything and its negation have necessarily different truth status?

As defended in [4] (pp. 26-28), "consistency is exactly what a contradiction might be lacking to become explosive", a position for which [3] demands an "epistemic elucidation". This request is endorsed by [2] pp. 162, who even abandons the philosophical discussion on LFI's at certain point, accusing such systems to be devoid of philosophical interest. Bremer in [3] wonders, putting things more precisely, how one could simultaneously sustain A and $\neg A$ as true, and the consistency of A as untrue.

We argue that this is not only plainly possible, but usual: logicians, infidel or not, perform this type of reasoning very often, and it is precisely the fact that A and $\neg A$ are true, while A is non consistent, which blocks the deductive explosion in paradoxes as the Sorites. Indeed, if a man is not bald, pulling out a hair will not make a bald head. However, continuing this procedure produces a head with no hairs, which is exactly a bald head. Therefore is the moon made of green cheese? Not so, would everyone say: we have here a contradiction, but some notions involved (e.g. the notion of "baldness" or "non-baldness") may not be congruous, or accordant, or in better words, consistent! It is squarely because this notion fails to be consistent that a contradiction involving it does not cause any explosion. On the other hand, it is possible to define (using modulated quantifiers, cf. [6]) a notion of "baldness" such that "non-baldness being preserved by pulling out hairs" would be a consistent notion, and then any contradiction obtained under this new notion would be explosive. Thus, not only consistency can be seen as independent of contradictoriness, but non-consistency is not necessarily coincident with contradictoriness.

As much as Berkeley's criticisms are dissipated when explained against the rigorous notion of limit, new logical relationships are clarified when regarded in an unbiased way. Berkeley could not see that evanescent increments did not have to be defined using the "old" rules for numbers, but now more than half century have passed since A. Robinson showed that because the notion of infinitesimal is in fact logically coherent, the infinitesimals enrich the domain of numbers, instead of conflict with them.

It is time to see negations, contradictions, consistency and inconsistency with another eyes, since logically coherent they surely are. Let us not be scared by the ghosts of our own departed prejudices.

[1] G. Berkeley, *The Analyst; or a Discourse Addressed to an Infidel Mathematician.* On line text available from Trinity College, Dublin (Edited by David R. Wilkins). `http://www.maths.tcd.ie/pub/HistMath/People/Berkeley/Analyst/Analyst.html`.

[2] F. Berto, ***How to Sell a Contradiction: The Logic and Metaphysics of Inconsistency***, College Publications, London, 2007.

[3] M. Bremer, ***An Introduction to Paraconsistent Logics***, Peter Lang Bern/New York/Frankfurt a.M., 2005.

[4] Walter A. Carnielli and João Marcos, *A taxonomy of C-systems*, ***Paraconsistency: The Logical Way to the Inconsistent, Proceedings of the II World Congress on Paraconsistency*** (W. A. Carnielli, M. E. Coniglio, and I. M. L. D'Ottaviano, editors), volume 228 of Lecture Notes in Pure and Applied Mathematics, Marcel Dekker, New York, 2002, pp. 1–94.

[5] Walter A. Carnielli, Marcelo E. Coniglio and João Marcos, *Logics of Formal Inconsistency*, ***Handbook of Philosophical Logic*** (D. M. Gabbay and F. Guenthner, editors), 2nd Edition, volume 14, Springer, New York, 2007, pp. 15–107.

[6] Walter A. Carnielli, Paulo Petrillo and Paulo Veloso, *Digging for quantifiers*, manuscript.

[7] A. Robinson, ***Non-standard analysis***, Revised edition, Princeton University Press, 1996.

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There are many paraconsistent logics, but there is no general and universal theory concerning such systems. Paraconsistentization of logics attempts to approach the concept of *paraconsistency* from the viewpoint of universal logic, and instead of investigating and proposing new paraconsistent systems, it studies methods and techniques used to answer two questions:

1. Given a logic, how can one obtain its paraconsistent counterpart?

2. Given a paraconsistent logic, how can one obtain the non-paraconsistent counterpart of this logic?

I have used *to paraconsistentize* to refer to the process of turning a given logic into a paraconsistent logic and the substantive *paraconsistentization* to refer to the plurality of methods, strategies and techniques which can be used to paraconsistentize a given logic. This talk describes and proposes forms of paraconsistentization.

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Prima facie, pluralism in mathematics is a philosophical attitude towards mathematical theories, but we can be philosophically pluralist too. Distinguish between an optimal pluralist philosophy of mathematics and a maximal pluralist philosophy of mathematics. An optimal pluralist will be anti-reductionist, so allow different theories in mathematics, but will be interested in giving some norms for philosophically well motivated theories (i.e., for "successful" mathematics). Norms might include consistency, logical justification, some constructive considerations, etc.

In contrast, a maximal pluralist philosophy of mathematics will both allow different theories in mathematics and will tolerate some "unsuccessful" mathematics. The maximal pluralist is impressed by the thought that the philosophers role is to describe mathematics not prescribe mathematics. She ends up with a philosophical pluralism, as well as a mathematical pluralism.

To show this, we consider some controversial types of mathematical theory. Start with paraconsistent theories. An optimal pluralist philosophy such as Shapiro's structuralism will not tolerate paraconsistent theories. However, paraconsistent theories will be tolerated by the maximal pluralist, since they figure in the corpus of mathematics. What about incomplete theories and trivial theories? Dealing with these is challenges our prejudices. We need to characterise, reason over, and compare incomplete and trivial theories. Our best hope is to couch the characterisation in a paraconsistent logic. The logic is a little different from regular paraconsistent logics in that one type of variable ranges over mathematical theories (as opposed to just wffs). With careful use of the Routley/Priest Characterisation Principle, the maximal pluralist can accommodate such theories. Couching the comparison of mathematical theories in a paraconsistent (dialethic?) logic brings with it its own meta-philosophical stamp.

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In the *Analytica Priora* (B15) Aristotle explains "In which figures it is possible to deduce from opposite premises, and in which figures it is not". The whole passage has been known in the history of logic literature. Bocheński [2, p. 60-62] quotes it in his discussion about the Principle of Non-Contradiction in Aristotle. Concerning paraconsistency in Aristotle's theory of syllogism, the most ancient indication is founded in da Costa, Béziau, and Bueno [3, p. 142–150]. Recently, Priest [4, p. 5–6], from the same Aristotelian excerpt concludes that the syllogistic is paraconsistent. According to Aristotle, the following syllogisms are valid from opposite (contradictory and contrary) premises, where small Latin letters stands for terms such as subject and predicate and, capital Latin letters stands for the four categorical propositions such as in the traditional notation: *i*) in the second figure: $\mathsf{Eab}, \mathsf{Aab} \vdash \mathsf{Ebb}$ (Cesare), $\mathsf{Aab}, \mathsf{Eab} \vdash \mathsf{Ebb}$ (Camestres), $\mathsf{Eab}, \mathsf{Iab} \vdash \mathsf{Obb}$ (Festino), e $\mathsf{Aab}, \mathsf{Oab} \vdash \mathsf{Obb}$ (Barroco); (*ii*) in the third one: $\mathsf{Eac}, \mathsf{Aac} \vdash \mathsf{Oaa}$ (Felapton), $\mathsf{Oac}, \mathsf{Aac} \vdash \mathsf{Oaa}$ (Borcardo), e $\mathsf{Eac}, \mathsf{Iac} \vdash \mathsf{Oaa}$ (Ferison). The results allow us to propose an interpretation of his theory of syllogism as a general paraconsistent logical theory. In order to support this reading, we carry out two different kinds of analysis. Firstly, we procedure a hermeneutical one, evaluating the quoted passage and its logical significance jointly with an appreciation of the interplay of this text with other important points of Aristotle's philosophy, specially, those related to the Principle of Non-Contradiction. Secondly, we exploit the proper logical interpretation for the results supported by Aristotle, mainly in the form of the antilogism, a decision procedure for Aristotelian syllogistic proposed by Christine Ladd-Franklin. We intent study these two approaches not yet analysed in detail in the literature.

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[2] Innocentius Mariae Bocheński, ***A History of Formal Logic***, University of Notre Dame Press, 1961. Translated from German and edited by Ivo Thomas.

[3] Newton Carneiro Affonso da Costa, Jean-Yves Béziau and Otávio Bueno, ***Elementos de teoria paraconsistente de conjuntos***, Campinas, SP: Centro de Lógica, Epistemologia e História da Ciência (CLE, 23), 1998.

[4] Graham Priest, *Paraconsistency and Dialetheism*, in Dov Gabbay and John Woods (editors), ***Handbook of the History and Philosophy of Logic***, to appear, 2005.

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It is well known that the paraconsistent logics $\mathcal{C}_n$ of da Costa fail to be algebraizable [1, 4]. Even so, an algebraic counterpart for them has been proposed in the literature, namely the class of da Costa algebras [2, 3]. Still, the connection between this proposal and $\mathcal{C}_n$ was never established at the light of the theory of algebraization of logics as introduced in [7].

In this work, we propose to use the tools and techniques of the novel theory of Behavioral Abstract Algebraic Logic, as introduced in [5], to study the $\mathcal{C}_n$ systems from an algebraic point of view and ultimately obtain a precise characterization of their relationship to da Costa algebras. As a side-effect, the algebraic nature of its bivaluation semantics [6] is also clarified.

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[5] C. Caleiro and R. Gonçalves and M. Martins, *Behavioral Abstract Algebraic Logic*, ***Submitted for publication***, 2007.

[6] N. da Costa and E. Alves *A semantical analysis of the calculi* $\mathcal{C}_n$, ***Notre Dame Journal of Formal Logic***, volume 18, number 4, 1977, 621–630.

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There is general agreement in the literature[1] that the extension of Lewisian Realism about possible worlds to the case of impossible worlds commits the theory to an actually inconsistent hypothesis. Anti-Lewisians employ arguments in support of such an extension as a *reductio* against Lewisian Realism, while Lewis uses the relevant *reductio* to reject impossible worlds. Either way it looks like one cannot become a Lewisian impossibilist without espousing strong paraconsistentism at best. In this paper I endeavour to argue to the contrary. I examine Lewis own objection against concrete impossible worlds and offer two responses one intended to soften the blow of the objection, and the other geared to block the objection altogether. Using the same techniques, I then reply to an objection by David Vander Laan on a somewhat similar vein, which turns on the Lewisian account of representation.

[1]For example, see David Lewis *Plurality of Worlds*, Oxford: Blackwell, 1986 (p.7n), Robert Stalnaker 'Impossibilities' *Philosophical Topics* 24: 193-204, 1996, Takashi Yagisawa 'Beyond Possible Worlds' *Philosophical Studies* 53: 175-204, 1988, John Divers *Possible Worlds*, London: Routledge 2002 (pp.76-77), David Vander Laan 'The Ontology of Impossible Worlds' *Notre Dame Journal of Formal Logic* 38.4: 697-620, 1997, Margery Bedford Naylor 'A Note on David Lewiss Realism about Possible Worlds' *Analysis* 46: 28-29, 1986.

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Inconsistency–Adaptive Logics.

Most paraconsistent logics avoid explosion by invalidating some of the classical rules of inference (e.g. disjunctive syllogism). Inconsistency–adaptive logics (**IAL**) do so in a different way. Intuitively, they interpret a premise set as consistently as possible, meaning that they presuppose an inconsistency to be false, unless or until proven otherwise. Proof theoretically, this comes down to the following: if a formula of the form $A \vee (B \wedge {\sim}B)$ has been derived on the line of an adaptive proof, the formula A may be derived on a new line, under the condition that $B \wedge {\sim}B$ is not proven problematic. As a consequence, **IAL** do not reach paraconsistency by invalidating some of the classical inference rules in general. They merely invalidate the problematic applications of those inference rules.

Modal Inconsistency–Adaptive Logics.

As all adaptive logics, **IAL** are characterized by three main components: a lower limit logic, a set of abnormalities and an adaptive strategy. In case of **IAL**, the lower limit logic is a paraconsistent logic and the set of abnormalities contains only inconsistencies (possibly of a restricted form).

Up to now, only **IAL** with a non–modal lower limit logic have been developed. If modal logics were used, this was solely to characterize paraconsistent inference relations under a translation, and not to extend the inconsistency–adaptive approach to modal logics as such. Though, in this paper, I will present some **IAL** that take a modal paraconsistent logic as their lower limit logic. This results in a new class of **IAL**: modal inconsistency–adaptive logics. However, some restrictions on the modal lower limit logics are necessary. I will only consider normal modal logics that have at least a reflexive accessibility relation and that contain all the de Morgan's laws, as well as their modal analogues.

[1] Diderik Batens, *Inconsistency-adaptive logics*, ***Logic at work. Essays dedicated to the memory of Helena Rasiowa*** (Ewa Orłowska, editor), Physica Verlag (Springer), Heidelberg, New York, 1999, pp. 445–472.

[2] Diderik Batens, *A survey of inconsistency-adaptive logics*, ***Frontiers of paraconsistent logic*** (Diderik Batens, Chris Mortensen, Graham Priest, and Jean Paul Van Bendegem, editors), Research Studies Press, Baldock, UK, 2000, pp. 49–73.

[3] Diderik Batens, *A universal logic approach to adaptive logics*, ***Logica Universalis***, vol. 1 (2007), pp. 221–242.

[4] Graham Priest, *Paraconsistent logic*, ***Handbook of philosophical logic***, (D.M. Gabbay and F. Guenthner, editors), vol. 6, Kluwer Academic Publishers, Dordrecht/Boston/London, 2nd ed., 2002, pp. 287–393.

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According to the classical consistency presupposition, contradictions have an explosive character: Whenever they are present in a theory, anything goes, and no sensible reasoning can thus take place. A logic is paraconsistent if it disallows such presupposition, and allows instead for some inconsistent yet non-trivial theories to make perfect sense. The *Logics of Formal Inconsistency*, **LFI**s, form a particularly expressive class of paraconsistent logics in which the metatheoretical notion of consistency can be internalized at the object-language level. As a consequence, the **LFI**s are able to recapture consistent reasoning by the addition of appropriate consistency assumptions. So, for instance, while typical classical rules such as disjunctive syllogism (from A and ⟨not-A⟩-or-B, infer B) are bound to fail in a paraconsistent logic (because A and ⟨not-A⟩ could both be true for some A, independently of B), they can be recovered by an **LFI** if the set of premises is enlarged by the presumption that we are reasoning in a consistent environment (in this case, by the addition of ⟨consistent-A⟩ as an extra hypothesis of the rule). The present contribution will provide an introduction to the class of **LFI**s [1, 2], as well as an illustration of how rich this class is, in that it naturally contains most logics originating from both the Brazilian and the Polish schools of paraconsistency and is characterized by the same kind of derivability adjustment theorem that gives foundation to the logics originating from the Belgian school of paraconsistency.

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Available at
URL Address: `http://wslc.math.ist.utl.pt/ftp/pub/MarcosJ/05-M-PhDthesis.pdf`

[2] Walter Carnielli, Marcelo E. Coniglio and João Marcos, *Logics of Formal Inconsistency*, ***Handbook of Philosophical Logic*** (Dov M. Gabbay and Franz Guenthner, editors), 2nd edition, volume 14, Springer, Dordrecht, 2007, pp. 1–93.

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I begin by distinguishing between a statements truth conditions and its information conditions. I argue that logical validity should be understood as the preservation of information in situations. Once we distinguish between the truth and information conditions associated with the various connectives, we can support non-classical logics (such as relevant logic) at the same time as accepting the classical truth conditions for most of the connectives (the exception is implication). And the combination of informational semantics with classical truth conditions gives us a motivation for a paraconsistent theory of negation at the same time as giving a well-motivated rejection of dialetheism. But this informational approach to logic does not force us to accept classical truth conditional semantics. This paper explores what happens when we combine informational semantics with gappy and glutty theories of truth. It is argued that the resulting theories open up interesting possibilities, in particular, it provides the basis for an intuitive treatment of higher-order vagueness.

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The aim of this paper is to present a new paraconsistent deontic logic (called **MI**) and its adaptive version $\mathbf{MI^m}$. The monotonic logic **MI** is based on an extremely weak paraconsistent logic, with gluts for the negation, gaps for the disjunction, and gluts as well as gaps for the conjunction. As a result, the principle of 'modal inheritance' (if $\vdash A \supset B$ then $\vdash OA \supset OB$) is invalid in **MI**. So are each of the following rules: $OA, OB \nvdash_{\mathbf{MI}} O(A \wedge B)$. $O(A \wedge B) \nvdash_{\mathbf{MI}} OA$, and $OA \nvdash_{\mathbf{MI}} O(A \vee B)$.

In the adaptive logic $\mathbf{MI^m}$, the principle of modal inheritance as well as the above mentioned rules are valid for all obligations that behave consistently. When applied to a set of premises that is consistent, $\mathbf{MI^m}$ yields all consequences of Standard Deontic Logic. When applied to a set of premises that is inconsistent, the set of consequences is "as rich as possible" without any form of deontic explosion being validated.

I shall present both the semantics and the proof theory of $\mathbf{MI^m}$. The proof theory is dynamical (conclusions derived at some stage of a proof may be rejected at a later stage), but is sound and complete with respect to the (static) semantics. I shall argue that $\mathbf{MI^m}$ has several advantages as compared to the existing systems. I shall also show that $\mathbf{MI^m}$ leads to the desired results for the examples described in the literature. For instance, in the case of Horty's Smith example, $\mathbf{MI^m}$ enables one to derive OS from $\mathsf{O}(\mathsf{F} \vee \mathsf{S})$ and $\mathsf{O}\neg\mathsf{F}$, and in the case of Goble's Jones example OS is $\mathbf{MI^m}$ -derivable from $\mathsf{O}(\mathsf{T} \wedge (\mathsf{F} \vee \mathsf{S}))$ and $\mathsf{O}\neg(\mathsf{T} \vee \mathsf{F})$. As Goble observes in [1], none of the currently available deontic systems adequately solves the latter problem. $\mathbf{MI^m}$ moreover has the nice property that, whenever OA and OB are mutually incompatible, $\mathsf{O}(\mathsf{A} \vee \mathsf{B})$ is derivable from them.

[1] Lou Goble, *Normative Conflicts and the Logic of Ought.* To appear.

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Belnap and Dunn in [1] claim that "The contrary of the relevantist is the *classicalist*." They are joined posthumously in this opinion by Anderson in [2]. We take in the present essay the dialetheist position by embracing **both** views. To do so we introduce the truly minimal relevant logic $\mathbf{CB}^*$, built around the ternary R relation of [3] that explicates relevant $\rightarrow$ and the Routley and Routley * operation of [4] that looks after DeMorgan $\sim$. $\mathbf{CB}^*$ will be *relevant* because of its ternary semantics. It will be *minimal* because, like the minimal normal modal logic $\mathbf{K}$, *no postulates* are imposed on the accessibility relation. And finally $\mathbf{CB}^*$ will be *classical* in virtue not merely of the usual distributive lattice connectives $\wedge$ and $\vee$ but also in virtue of its *two* classical negations, Boolean $\neg$ as well as DeMorgan $\sim$. Both negations make true all forms of the classical double negation and DeMorgan laws, together with appropriate transposition and *reductio* principles. But the Boolean $\neg$ is the *more* classical.

We turn now to the "Key to the Universe" (henceforth, $\mathsf{K2U}$) of [5] and [6]. It was a wonderful discovery, in the early days of relevant semantics, that the *postulates* for different relevant logics *closely reflect* the combinator axioms of Curry's [7]. Our best results in this area were obtained with (more truthfully, by) Pal in [8]. We shall extend these results to the CB* context.

Semantic definitions yield rich pickings for $\mathbf{CB}^*$. It is a conservative extension of the (minimal) relevant logics $\mathbf{B} \wedge \mathbf{T}$, $\mathbf{B} + \mathbf{T}$, $\mathbf{B}$, $\mathbf{CB}+$ and $\mathbf{CB}$. We may moreover define in $\mathbf{CB}^*$ a host of further familiar relevant particles — e. g., the right-to-left conditional $\leftarrow$ (to go with $\rightarrow$, which is left to right), the fusion (relevant conjunction) $\circ$, the equivalence $\leftrightarrow$ and many others. Moreover, as there are "multi-modal" extensions of K, just so there are "multi-relevant" extensions of **CB***.

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Alessio Moretti, *New light on the Priest-Slater-Béziau debate on the hidden geometry of paraconsistency.*
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H. Slater [12] argued both against G. Priest's system LP [9] and paraconsistency in general (i. e. including N.C.A. da Costa's systems), invoking the fundamental opposition relations (and especially "contradiction") constituting Aristotle's "logical square". Among other responses to that famous argument [1, 4, 10], J.-Y. Béziau [2] constructed a defence of paraconsistency relying on A. Sesmat's [11] and R. Blanché's [3] "logical hexagon", a mathematically powerful conservative extension of the logical square. He argued that in logical hexagons one can find, from a modal point of view, beside the "classical negation" (i.e. "contradictory negation") dear to Slater, paracomplete (i.e. intuitionist) and paraconsistent negations.

In [5] we showed that the logical square and hexagon (followed by the "logical cube", followed by ...) are just instances of the more general notion of "logical bi-simplex of dimension m" ($m \in$N). The new science of this is N.O.T., "n-opposition theory" ($n=m+1$). The relevance of this new geometry of logical opposition for the research in paraconsistency seems so far confirmed in at least two ways: (1) philosophically, it can be shown (as hinted in [6]) that N. A. Vasil'ev's "imaginary logic" (1912), a possible ancestor of paraconsistent logic, is an unformalised fragment of n-opposition theory and that he was very close, by his "triangle of contrariety", to the discovery of the logical hexagon;

(2) mathematically, R. Pellissier [8] has discovered, independently from modal semantic interpretations (as Béziau's), a powerful "topological hexagon" furnished itself with classical, paraconsistent and paracomplete negations.

In [7] we show that the notion of "logical bi-simplex" (of dimension m) is itself a particular case of the notion of "logical p-simplex (of dimension m)" ($p \in \mathrm{N}$, $p \geqslant 2$). So, in this paper we want to introduce more intuitively this global new fact by showing the shapes and axioms of the "logical tri-simplexes" of dimension 1, 2 and 3, that is, the "logical tri-segment", the "logical tri-triangle" and the "logical tri-tetrahedron", discussing their incidence on the aforementioned debate on the essence of paraconsistent negation.

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The strategy of *Chunk and Permeate*, first defined by Brown and Priest, is analysed, with the aim of showing that it dualises to a certain kind of paraconsistent theory-construction.

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We utilise the visual essay "The Impossible University" to distinguish several classes of inconsistent images, and raise the question of which, if any, qualify as occlusion illusions.

Marek Nasieniewski and Andrzej Pietruszczak, *On modal logics defining Jaśkowski's D_2-consequence.*
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Jaśkowski's propositional calculus (logic) $\mathbf{D_2}$ has been formulated by means of **S5** (see [1, 2]) in the following way:

$$\mathsf{B} \in \mathbf{D_2} \text{ iff } \Diamond \mathsf{B}^* \in \mathbf{S5},$$

where * is Jaśkowski's transformation. In [3] it has been proved that **S4** and **S5** contain the same theses beginning with '◊' — so, to obtain $\mathbf{D_2}$ one can use weaker than **S5** modal logics. In [4] a minimal normal logic in this class has been indicated and called $\mathbf{S5^M}$.

The logic $\mathbf{D_2}$ is connected with (discussive) deductive systems based on the following consequence relation:

$$\mathsf{A}_1, \ldots, \mathsf{A}_n \vdash_{\mathbf{D_2}} \mathsf{B} \text{ iff } \Diamond \mathsf{A}_1^*, \ldots, \Diamond \mathsf{A}_n^* \Vdash_{\mathbf{S5}} \Diamond \mathsf{B}^*,$$

where $\Vdash_{\mathbf{S5}}$ is modus-ponens-style consequence based on **S5**. We prove that **KD45** is minimal, while **S5** is maximal among normal logics which define the same consequence relation $\vdash_{\mathbf{D_2}}$. Neither $\mathbf{S5^M}$ nor **S4** is appropriate for this purpose.

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Hitoshi Omori and Toshiharu Waragai, *Some New Results on PCL1 and its Related Systems.*
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In the study of paraconsistent logic, there seem to have been two different approaches to the subject; one is to take the notion of 'behaving classically (BC)' as a *primitive* notion, and the other is to *define* the notion using other connectives. Carnielli and Marcos took the former 'abstract' approach, and the latter 'concrete' approach was taken in C_n, J_3, P^1, PCL1 (cf. [1]), etc.

Our presentation will focus on the 'concrete' approach, keeping the 'abstract' approach in mind.

In general, the following theses are accepted as axioms of paraconsistent logic:

(LEM) $A \vee NA$

(DNE) $NNA \supset A$

There are some who claim them to be of *ad hoc* character. However, the fact is just on the contrary. We will show that (LEM) and (DNE) are two basic laws governing the logical behaviour of paraconsistent negation.

In the previous paper [1] by one of the present authors, the notion of BC is expressed by the following condition:

(BCWS) $A \supset NNA$ (written as A^I)

We will show that (BCWS) expresses a natural condition for a formula A to behave classically to which S5 and Lindenbaum's Theorem are closely related.

Some results on the strong negation in PCL1, which is defined by using a bottom particle, would also be shown. Since this strong negation in PCL1 is not a classical negation, we shall observe some conditions for it to be a classical negation, and introduce a related system of PCL1, named PCL1C, by adding certain formula.

Finally, we will examine other notions of BC given by da Costa ($N(A \wedge NA)$) and Guillaum ($N(A \equiv NA)$) from the viewpoint of PCL1C.

[1] Toshiharu Waragai and Tomoki Shidori, *A system of paraconsistent logic that has the notion of "behaving classically" in terms of the law of double negation and its relation to S5*, ***Paraconsistency with no Frontiers*** (Jean-Yves Beziau and W. A. Carnielli, editors), North-Holland, to appear, pp. 155–164.

Francesco Paoli, *A Paraconsistent and Substructural Conditional Logic.*
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We introduce and motivate a substructural and paraconsistent logic of conditionals, which can be seen as an expansion by additional connectives of linear logic without exponentials and without additive constants. The hallmark of this system is the presence of three logical levels (each one of which contains its own conditional connective), linked to one another by means of appropriate distribution principles. Such a theory brings about a twofold benefit: on the one hand, it suggests a new classification of conditionals where the traditional dichotomies (indicative vs. subjunctive, factual vs. counterfactual) do not play a decisive role; on the other hand, it allows to retain suitable versions of both substitution of provable equivalents (SPE) and simplification of disjunctive antecedents (SDA), while still keeping out such debatable principles as transitivity, monotonicity, and contraposition. In such a way, we suggest a possible solution to a long-standing open problem of conditional logic.

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There is a question that we might ask in general about paraconsistent logic: what does paraconsistent logic do to the meaning of logical connectives? This is a perennial debate in the philosophy of logic, but what if the debate could be avoided altogether? The question is whether there could be paraconsistent logics which do not change the meaning of the connectives. I suggest that we not use logics, but a kind of derived inference relation.

The method offered for doing this is Schotch-Jennings forcing. This method takes a logic $\mathfrak{L}$ and produces a consequence like relation $[\Vdash$ which is a subset of the original consequence relation of $\mathfrak{L}$. Forcing is only a consequence like relation since it does not obey the usual axioms for Tarskian consequence relations. In particular, forcing is non-monotonic. The problem at hand is whether the meaning of the logical constants change when we use forcing? The intuitive answer is negative since forcing is a derived relation from a logic, but I think we can do better.

I will consider two approaches to construing the meaning of the logical constants. First is the proof theoretic approach. The other is a kind of semantic version. In the first case I argue that if the proof theory is supposed to give the meaning of the logical constants, then the meaning is preserved since the proof theory is remains unchanged. In fact, the proof theory is required to remain unchanged so that the forcing relation function.

The semantic approach to meaning considers algebraic semantics of a logic. As in the proof theory it is a question about how the connectives interact. In the algebraic approach to logic those interactions are encoded in the classes of algebras for the logic: meaning and Lindenbaum-Tarski algebras. The question is then what happens to these algebras under this transformation? I show that the SJ-forcing relation for $\mathfrak{L}$ preserves much of the structure of the underlying logic, including the Lindenbaum-Tarski algebras; however, the meaning algebra is not always so lucky.

However, depending on the classes of algebras for the logic $\mathfrak{L}$, the meaning algebra relative to a particular model can be from the same class of algebras as the meaning algebras for $\mathfrak{L}$. The interesting philosophical question to be addressed is whether there is important information lost about the interactions of the formulas. I will argue that what is lost does not affect the algebraic interpretations of the logical connectives. Since the information lost does not adversely affect the semantic interpretation, the meaning of the logical connectives remains intact.

What is important to note is that the meaning of the connectives is regarded from the point of view of the individual formulas. So the meaning of the connectives is the same from the point of view of the underlying logic since it is at the level of formulas where they receive their semantic interpretations.

Since both of these approaches leaves the meanings of the connectives unharmed, I conclude that forcing does not change their meanings. Thus, the logical pluralist has a method to deal with inconsistent sets regardless of thier choice of explosive logic.

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In a brief passage of [1], Michael Dummett suggests that a theory of meaning might best be based on falsification conditions for statements. The basic idea of such a theory would be that an assertion is incorrect if it is falsifiable, and that the notion of correctness is derivative of that of incorrectness. He then goes on to sketch a type of Dual Intuitionistic Logic that such an approach might lead to. In this talk, I'd like to suggest that Dummett's arguments can be restated convincingly to account for the phenomenon of faultless disagreement: One person may say "Spinach is tasty", while the next may respond "No, spinach is not tast". Unlike with other disputes of this form, here we are reluctant to say that one of them must be at fault. Nonetheless, it seems that there is genuine disagreement between the two speakers. The problem is that these two intuitions cannot be upheld given classical logic and a few widely accepted semantic assumptions.

To deal with this problem, [2] suggests the adoption of semantic relativism, while [3] tries to apply intuitioinstic logic to it; neither attempt is completely convincing. In the first case, it is questionable whether we are really dealing with disagreement, while the second leaves doubts as to the faultlessness of the situation.

I will suggest that Dual Intuitionistic Logic fulfills some essential requirements of a logic governing such discourses, one of which is being a paraconsistent logic. The resulting picture comes closer to capturing the notion of faultless disagreement than the attempts mentioned above and gives a further incentive for a deeper investigation of Dual Intuitionistic Logic.

[1] Michael Dummett, *What is a Theory of Meaning II*, ***Truth and Meaning*** (G. Evans, J. McDowell, editors), Oxford University Press, Oxford, 1976.

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[3] Crispin Wright, *Intuitionism, Realism, Relativism and Rhubarb*, ***Truth and Realism*** (P. Greenough, M. Lynch, editors), Oxford University Press, Oxford, 2006.

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In the first part of this paper I will show that sorites paradoxes have the form of an inclosure, the same structure that underlies the paradoxes of self-reference. (See [1, Part 3].) So, despite appearances, sorties paradoxes and the paradoxes of self-reference are the same kind of paradox. They should therefore have the same kind of solution. If one endorses a dialetheic solution to the paradoxes of self-reference, as I do [2]), one should endorse a dialetheic solution to sorites paradoxes In the second part of the paper I describe what such a solution is like. Prima facie, a distinctive feature of solutions to sorites paradox is the problem posed by higher order vagueness. In the third part of the paper, I will show how this is accommodated from the present perspective.

[1] Graham Priest, *Beyond the Limits of Thought*, Second Edition, Oxford: Oxford University Press, 2002.

[2] Graham Priest, *In Contradiction: a Study of the Transconsistent*, Second Edition, Oxford: Oxford University Press, 2006.

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The notion of update, introduced in the literature on belief change in early work in [3] and [4], has been formalised in [5] according to an intuitive difference with the notion of revision: the latter formalizes changes due to new information in a static world, update refers to the changes that a knowledge base undergoes when the world of reference changes. The standard approach to update refers to a model-theoretic interpretation which aims at satisfying Gärdenfors postulates and it uses a notion of minimality of difference between bases. An obvious extension of this notion of update has been given in terms of inconsistent knowledge bases and addition of inconsistent information. Such cases can be dealt with as a standard revision procedure, or rather as a treatment of update procedures in a paraconsistent logic approach, see e.g. [2].

In this paper a novel approach to Information Update is presented. It consists of a model for processing updates which allows to extract *consistent* states of knowledge in view of updates with information that is inconsistent with the given base. This is obtained by a Prioritized Adaptive Logic, called **AIU**, for *Adaptive Informational Update*.

AIU is defined as a multi-modal version of the logic **T**, with update operators $I_1, \ldots, I_n$. Intuitively, $I_i A$ expresses that the agent receives the update with the information that A at time i. The logic is intended for cases where the agent accepts A but receives the update that $\sim A$. This is expressed by a set of abnormal formulas of the form $I_i \sim A \wedge A$.

The indices establish a priority relation over contents: the higher the index, the higher the priority. Information operators in this model are interpreted as possibility operators. Each new update is considered more reliable than the beliefs at the previous moment, and each belief remains defeasible in view of new incoming information. This notion of information in terms of a possibility operator corresponds to a non-standard interpretation of the epistemic operation of becoming informed.

The approach formalised by **AIU** - in line with the standard format of Adaptive Logics, see [1] - provides both a semantics and a proof theory to model the process of update. Proof-theoretically this is obtained by deriving beliefs from previous updates on the condition that certain later updates are false; failing this condition, previous updates are rejected. Model-theoretically, one first selects the models of a given premise set that verify a minimal number of the most recent inconsistent updates; next, one goes on for the updates that are less recent, up to the oldest information.

The dynamics of updates designed by **AIU** preserves the most recent information, which is considered as the most reliable.

[1] Batens, D., *A Universal Logic Approach to Adaptive Logics* ***Logica Universalis***, 2007, vol. 1, pp. 221-242.

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[3] Fagin, R., Ullman, J.D., Vardi, M.Y., *On the Semantics of Updates in Databases* ***Proc. Second ACM SIGACT-SIGMOND*** Symposium on Principles of Database Systems, Atlanta, 1983, pp. 352-365.

[4] Keller, A.M., Winslett, M., *On the Use of an Extended Relational Model to Handle Changing Incomplete Information* ***IEEE Transactions on Software Engineering***, 11(7) 1985, pp. 620-633.

[5] Katsuno, H., Mendelzon, A.O., *On the Difference between Updating a Knowledge Base and Revising it* ***Principles of Knowledge Representation and Reasoning*** (in Allen, Fikes, Sandewall, editors), Morgan Kaufmann, San Mateo, California, 1991, pp. 387-394.

[6] Primiero, G., *An Epistemic Logic for Becoming Informed* ***Proceedings of the First Workshop in the Philosophy of Information and Logic*** forthcoming in a Special Issue of Logic, Rationality and Action (*Synthese*)

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The goal-directed proof search procedure for propositional classical logic (pCL) — as elaborated in [3] — happens to provide an effective tool for generating 'potential abductive explanations' (**pae**) and 'consistent potential abductive explanations' (**cpae**) — see [4]. (Briefly: given a theory $\mathcal{T}$, an explanandum $\mathcal{E}$ and a formula $\mathcal{A}$, $\mathcal{A}$ is a **pae** iff $\mathcal{T} \cup \{\mathcal{A}\} \vdash \mathcal{E}$, $\mathcal{T} \nvdash \mathcal{E}$, $\mathcal{A} \nvdash \mathcal{E}$ and $\mathcal{A}$ is 'minimal'; or a **cpae** when also $\mathcal{T} \nvdash \sim\mathcal{A}$.) The reason is that proof search procedures contain traces of the reasoning that may lead to the derivation of $\mathcal{E}$ and as such of the 'missing links' that are needed to derive (explain) $\mathcal{E}$ whenever $\mathcal{T} \nvdash \mathcal{E}$. In [4] it is shown that the generation of **pae** and **cpae** by means of pCL has a number of advantages compared to the algorithms based on semantic tableaux as elaborated in [1]: (i) premises are only introduced and analyzed in a proof if they are 'useful' in view of obtaining the explanandum, (ii) redundancy, irrelevance, inconsistency and partial or total self-explanation are dealt with in an efficient and more transparent way and (iii) explananda that are not literals can also be dealt with.

However, as 'Ex Falso Quodlibet' is isolated in pCL, and hence can be removed from the procedure without losing 'Addition' or 'Disjunctive Syllogism' – resulting in pCL^- [2] – I will show that an even more interesting procedure can be developed for the generation of **pae** on the basis of pCL^-. I will demonstrate that this procedure allows for a sensible treatment of 'abductive anomalies' (cases in which $\mathcal{E}$ is inconsistent with $\mathcal{T}$) and of cases where $\mathcal{T}$ is inconsistent itself. Abandoning 'Ex Falso Quodlibet' is also a step in the direction of the relevant logic enterprise. I will also indicate that the selection mechanism for 'useful' premises (and their specific treatment within the goal-directed proof procedure) introduces a notion of relevance that, though it might deviate from what is propagated by relevant logicians, is worth being explored. Another advantage of the procedure based on pCL^- is that its consequence set is equal to the one of pCL whenever $\mathcal{T}$ is consistent, but that it still allows to consider inconsistent explanations in a reasonable way whenever a theory forces one to do so.

[1] Atocha Aliseda, ***Abductive Reasoning. Logical Investigations into Discovery and Explanation***, Springer, Dordrecht, 2006.

[2] Diderik Batens, *A Paraconsistent Proof Procedure Based on Classical Logic*, `http://logica.ugent.be/centrum/writings/pubs.php` (nr. 181), 2003.

[3] Diderik Batens and Dagmar Provijn, *Pushing the Search Paths in the Proofs. A Study in Proof Heuristics*, ***Logique & Analyse***, 173–174–175:113–134, 2001.

[4] Joke Meheus and Dagmar Provijn, *Abduction through Semantic Tableaux versus Abduction through Goal-Directed Proofs*, ***Theoria***, To Appear.

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I have argued elsewhere [1] for interpreting a valid sequent $\vdash Y$ as having the force that the premises may not be coherently jointly asserted together with the joint denial of the conclusions.

For the paraconsistentist who denies the validity of $\neg A \vdash$, this means that the assertion of $\neg A$ and the denial of must be distinguished. They have different normative forces, since the assertion of $\neg A$ and the assertion of may be jointly coherent (this is paraconsistency), while the assertion of and the denial of may not be jointly coherent (this is just the validity of the sequent $\vdash A$).

In this paper, I discuss why distinguishing assertion of a negation and a denial should be seen as not a problem for paraconsistency but as a benefit. With this distinction clearly marked, the paraconsistentist has the resources to meet some a number of important objections to paraconsistency.

[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.

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Here, I recommend a formal semantics for vague expressions; the formalism is that of the familiar paraconsistent logic LP. I also recommend a dialetheic interpretation of this theory; I claim that vague predicates, when applied to their borderline cases, result in sentences that are both true and false.

I argue that this LP-based approach to vagueness has pleasant commitments: first, it provides a plausible account of the sorites argument's failure. Second, the proposal verifies much of our ordinary talk using vague predicates, e. g. 'It's both green and not green' and 'He's neither bald nor not bald'. Third, given some assumptions about the logical behavior of 'is true', the proposal also verifies common theoretical assertions such as 'Vague predicates are neither true of nor false of their borderline instances'.

It has been argued that a three-valued semantics (like one version of LP's semantics) for vague expressions can't be the full story, because such a semantics couldn't give an account of higher-order vagueness. I argue that the present theory, however, provides an attractive account of higher-order vagueness; what's more, the theory does not have to be supplemented with any extra principles in order to do so.

Although there is a strong similarity between the theory this paper recommends and its paracomplete dual, the theory is argued to be superior to its dual. Key features of the paraconsistent theory appealed to in its defense do not hold of its dual. The theory is also compared favorably to other paraconsistent proposals that have been floated.

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Neutrosophy has been introduced some years ago by Florentin Smarandache [2] as a new branch of philosophy dealing with "the origin, nature and scope of neutralities, as well as their interactions with dierent ideational spectra".

A variety of new theories has been developed on the basic principles of neutrosophy, among which is neutrosophic logics, a family of many-valued systems that can be regarded as a generalization of fuzzy logics.

The fundamental thesis of neutrosophy is that every idea has not only a certain degree of truth, as is generally assumed in many-valued contexts, but also a falsity degree and an indeterminacy degree that have to be considered independently from each other, thus allowing for inconsistency as well as incompleteness of information. Such indeterminacy may be interpreted both in a subjective and an objective sense, i. e. as uncertainty as well as imprecision, vagueness, error, doubtfulness etc.

In this paper we discuss the proposal of neutrosophic logics, focusing on the problems of interpreting the indeterminacy degree and dening suitable propositional connectives. We also discuss the relationship between neutrosophic logics and other well-known frameworks for reasoning with uncertainty, vagueness and inconsistency such as (intuitionistic and interval-valued) fuzzy systems and bilattice- based logics.

In particular, we consider a neutrosophic system recently introduced by Ashbacher [1] under the name of *paraconsistent neutrosophic logic*: we show that, somewhat unexpectedly, this system turns out to be equivalent to Belnaps four-valued logics.

[1] C. Ashbacher. *Introduction to Neutrosophic Logic.* American Research Press, Rehoboth, NM, 2002.

[2] F. Smarandache. *A Unifying Field in Logics: Neutrosophic Logic. Neutrosophy, Neutrosophic Set, Neutrosophic Probability.* American Research Press, Rehoboth, NM, 1999.

FABIEN SCHANG, *Can there be "truth-and-false-makers"?*
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The present paper concerns the philosophical relevance of dialetheism, especially in ontology. Against Priest, who claimed in [4] that glutty propositions should be endorsed but not gappy ones, the contrary seems to be the case from an ontological perspective: it has been said in [1] that glutty states of affairs are a queer idea. Why so?

After a first debate about how to maintain the law of excluded middle while abandoning bivalence, it is argued in [5] that one and the same maker cannot be seen as a both truth- and false-maker because of the Law of Incompatibility as depicted in [2] and [7]. But dialetheists could easily reply that such an ontological foundation of logical laws is unwarranted, as Priest did in [3] and [4].

We'll consider both the price to pay for true contradictions as a logical tool in philosophy and a couple of epistemological obstacles against "truth-and-false-makers", namely:

1. the law of incompatibility, and its so-called "impossible facts";
2. the relation between metaphysical and logical possibilities, and its import in logic of imagination;
3. the inapplicability of dialetheism from an epistemic view of truth-values, given a distinction between denial and negative assertion as in [6].

Such an inconsistent maker should be acceptable provided that a prior distinction is made between truth-makers, false-makers, and truth-and-false-makers. But if so, dialetheists should accept general facts and reject logical atomism if they want to apply their strongly paraconsistent picture of the world.

[1] D. M. Armstrong, ***Truth and Truthmakers***, Cambridge Studies in Philosophy (2004).

[2] R. Demos, *A Discussion of a Certain Type of Negative Proposition*, ***Mind*** 26(102) (1917), 188–196.

[3] G. Priest, ***In Contradiction***, Dordrecht: Martinus Nijhoff (1987).

[4] G. Priest, *To Be and Not to Be: That is the Answer. On Aristotle on the Law of Non-Contradiction*, ***Philosophiegeschichte und Logische Analyse***, 1(1998), 91-130.

[5] F. Schang, *On how Truthmaking Negative Propositions*, ***The Reasoner***, 1(8) (2007), 5–6.

[6] T. Parsons, *Assertion, Denial, and the Liar Paradox*, ***Journal of Philosophical Logic*** 13(2) (1984), 137–152.

[7] L. Wittgenstein, Tractatus Logico-Philosophicus (1921), esp. §6.3751.

Peter Schotch, *Everything you wanted to know about the preservationist approach to paraconsistency, if only you'd known there was such a thing.*
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In spite of the fact that paraconsistent logic is no longer in its infancy, there remain some disagreements between practitioners. For the most part these are friendly but quite often one of the parties to the disagreement is unaware of its existence. How philosophical! This paper is an account, in quite basic terms of how the preservationist approach to paraconsistency differs from the dialethic one in terms of motivation and formalism both. In the past the preservationist accounts have often been characterized using the term "non-adjunctive" (one suspects that Richard Sylvan was responsible for the coinage). The current essay will argue that one might just as well refer to the dialethic approach as "non-negative." In fact the distinction between the two approaches is that preservationism is a quite general construction of a derived inference relation, from a basic relation. The earliest attempts took the basic relation to be the classical inference relation in aid of good marketing practice to the unconvinced (and largely classically minded) majority of practitioners and consumers of logic. Dialethism, on the other hand, tends to put forward a single logical system, which is not explicitly derived from some underlying one. This has both advantages and disadvantages. Anybody worried about the latter might well be interested in an alternative, and perhaps more general approach to paraconsistency.

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Say that a finite set of propositions has coherence bound δ if the ratio of the size of its largest consistent subset to the size of the whole set is greater than or equal to δ. A set (finite or infinite) has uniform coherence bound δ if each of its finite subsets has coherence bound δ. The degree of coherence of a set, Γ, can be measured as $\delta(\Gamma)$, the supremum of its uniform coherence bounds. Consistent sets have degree 1 and sets containing a contradiction have degree 0. Certain other sets can have these limiting degrees, depending on the underlying logic, but there are also many other sets with coherence degree strictly between

0 and 1. This paper explores the relationship between degrees of coherence and paraconsistent logic. In particular, I examine logics defined by $\Gamma \vdash \phi$ iff $\delta(\Gamma, \phi) > \delta(\Gamma, \neg\phi)$, which is paraconsistent. For example, $(p \ \& \ q), (p \ \& \ \neg q) \vdash p$ but $(p \ \& \ q), (p \ \& \ \neg q) \nvdash q$. Coherence bounds are related to the problem of an algebraic characterisation of probabilistic logics, as reported in [1].

[1] Jeremy Seligman, *Channels: from probability to logic*, ***Information Theories*** (G. Sommaruga, editor), Springer Lecture Notes in Computer Science, forthcoming.

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Rescher-Manor consequence relations, defined in terms of classical consequences of the maximal consistent subsets of (possibly) inconsistent sets of premises, have been characterised by inconsistency adaptive logics in [1]. Analogous to Meheus' extension of Jaskowski's paraconsistent system D_2 into an adaptive logic AJ based on S5 (*cp.* [3]), Batens in [2] formulated an extension of flat Rescher-Manor consequence relations making them more applicable to the context of discussions. The main advantage of such a strengthening is the fact that they enable one to spell out implicit agreements by means of locating explicit disagreements. Although both approaches of [3] and [2] can be interpreted in terms of not contradicted statements made by participants (respectively, statements made by consistent groups of participants), there is a slight difference between them which can be shown already by means of simple examples.

The present paper offers a modeling of both extensions of the Rescher-Manor consequence relations. The systems are formulated in terms of inconsistency-adaptive logics based on the paraconsistent logic CLuN, with the premise sets 'translated' in the same style as in [1]. As a result, unlike what happens in [2], adaptive logics are now all in standard format, while the approach from [3] is correctly rendered. With respect to the Rescher-Manor mechanisms, the result illustrates that a characterization in terms of inconsistency-adaptive logics suggests extensions and variations.

[1] Diderik Batens, *Towards the unification of inconsistency handling mechanisms*, *Logic and Logical Philosophy*, 8:5–31, 2000. Appeared 2002.

[2] Diderik Batens, *A strengthening of the Rescher–Manor consequence relations*, *Logique et Analyse*, 183–184:289–313, 2003. Appeared 2005.

[3] Joke Meheus, *An adaptive logic based on Jaśkowski's approach to paraconsistency*, *Journal of Philosophical Logic*, 35:539–567, 2006.

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A visual presentation of the elements in Graham Priest's 'Logic of Paradox' is produced, which, in the manner of Venn and Carroll Diagrams, and also Peirce's Alpha Graphs, enables calculations regarding theses and derivations in Priest's well-known paraconsistent logic to be conducted geometrically. The graphs are then used to reconsider Priest's claims about the possibility of perceiving contradictions. Priest has considered figures drawn from the works of Escher, for instance, to support this possibility, but much simpler and more persuasive visual examples can be produced in the light of the graphical presentation of his paraconsistent system, if his account of this is to be believed. A reconsideration of Paul Kabay's recent critique of Priest is then offered, along with a discussion of related work by Chris Mortensen and Laurence Goldstein, lending further support to the intensional view of paraconsistency the author set out in 2007.

[1] L. Goldstein, *Reflexivity, Contradiction, Paradox and M. C. Escher*, ***Leonardo*** (1996) 29, 299–308.

[2] P. Kabay, *When Seeing is not Believing: A Critique of Priest's Argument from Perception*, ***Australasian Journal of Philosophy***, (2006) 84.3, 443–460.

[3] C. Mortensen, *Peeking at the Impossible*, ***Notre Dame Journal of Formal Logic***, (1997) 38, 527–534.

[4] G. G. Priest, *The Logic of Paradox*, ***Journal of Philosophical Logic***, (1979) 8.2, 219–241.

[5] G. G. Priest, *Perceiving Contradictions*, ***Australasian Journal of Philosophy***, (1999) 77.4, 439–446.

[6] B. H. Slater, *Dialetheias are Mental Confusions* and *A Rejoinder to Priest*, in ***Handbook of Paraconsistency***, (D. Gabbay, J-Y. Beziau and W. Carnielli, editors) College Publications, London, 2007

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Recent work in adaptive logics has shown growing interest in (monadic) deontic systems which are able to deal with deontic dilemmas [4, 5, 6]. Unlike standard deontic logic (SDL), Goble's logic DPM [2, 1] prevents deontic explosions in such cases by means of restricting the inheritance principle ("if $\vdash \mathsf{A} \to \mathsf{B}$ then $\vdash \mathsf{OA} \to \mathsf{OB}$"), while having the same range of desired consequences for non-conflicting premise sets. Developing adaptive versions of DPM, Meheus and Strasser were able to improve it in various aspects [6].

It is well known that attempts to model conditional obligations in terms of monadic ought-operators (e.g. $\mathsf{O}(\mathsf{A} \to \mathsf{B})$ or $\mathsf{A} \to \mathsf{OB}$) have several shortcomings. This has led to various approaches based on dyadic ought-operators $\mathsf{O}(\mathsf{A}/\mathsf{B})$—"if B is the case you are obliged to do/bring about A". One of the most difficult problems is to handle cases in which the principle 'strengthening the antecedent' ($\mathsf{O}(\mathsf{A}/\mathsf{B}) \to \mathsf{O}(\mathsf{A}/\mathsf{B} \wedge \mathsf{C})$) has to be restricted. Paradigmatical

instances are settings in which exceptions and/or violations of general obligations occur, like for example [3]:
(i) You ought not to eat with your fingers: $\mathsf{O}(\neg\mathsf{F}/\top)$
(ii) You ought to put your napkin on your lap: $\mathsf{O}(\mathsf{N}/\top)$
(iii) If you are served asparagus, you ought to eat it with your fingers: $\mathsf{O}(\mathsf{F}/\mathsf{A})$
Goble's logic CDPM [1] is able to derive all the desired obligations (e.g. $\mathsf{O}(\mathsf{F}/\mathsf{N}\wedge\mathsf{A})$, $\mathsf{O}(\mathsf{N}/\mathsf{A})$), while blocking unwanted ones (e.g. $\mathsf{O}(\neg\mathsf{F}/\mathsf{A})$). Nevertheless, replacing (iii) with $\mathsf{P}(\mathsf{F}/\mathsf{A})$ leads to triviality—a severe shortcoming.

This paper presents an adaptive logic based on CDPM which has in both cases the desired consequences. Furthermore, while Goble's logic depends on adding various explicit permissions to the premise set in order to get the desired results, this is not needed for the adaptive version. In addition, the dynamic aspect of our moral reasoning is nicely recaptured by the dynamic proof theory. This also enables us to have a better insight in the relations between obligations/permissions and thus to localize the deontic conflicts as well as violations and exceptions of obligations as the product of an actual reasoning process.

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[2] Lou Goble, *A logic for deontic dilemmas*, ***Journal of Applied Logic***, 3:461–483, 2005.

[3] John F. Horty, *Nonmonotonic foundations for deontic logic*, In ***Defeasible Deontic Logic***, pages 17–44, 1997.

[4] Joke Meheus and Diderik Batens, *An adaptive logic for moral conflicts*, To appear. Presented at the Studia Logica International Conference 2006, Torun.

[5] Joke Meheus and Christian Strasser, *Avoiding deontic explosion by contextually restricting aggregation*, To appear. Presented at CLMPS 2007, Beijing.

[6] Christian Strasser and Joke Meheus, *Adaptive versions of the deontic logics DPM*, To appear. Presented at CLMPS 2007, Beijing.

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In the paper [1] Brown and Priest suggest a paraconsistent reasoning strategy called Chunk and Permeate (C&P). They then claim (without proving) that C&P can model the reasoning process of the infinitesimal calculus of Newton and Leibniz. In this talk I will show that they were right with respect to Newton, but wrong with respect to Leibniz. Using examples from Newton I will demonstrate a C&P system that models Newton's reasoning. I will sketch a proof of the consistency of this system. I will then use some examples from Leibniz (via L'Hospital) to show that no C&P system can be made to model Leibniz's use of infinitesimals. These results demonstrate a marked difference between the infinitesimal methods of Newton and Leibniz. They also show that Newton's calculus can be modeled with a logic that is almost classical.

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[2] Guillaume de l'Hospital, *The Method of Fluxions—Both Direct and Inverse*, (E. Stone, Translator), William Innys, London, 1730.

[3] Isaac Newton, ***Two Treatises of the Quadrature of Curves***, (John Stewart, Translator and Comentator) James Bettenham, London, 1745.

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Max Cresswell and Hilary Putnam hold a view, often shared by classical logicians, that paraconsistent logic has not been 'made sense of', despite its well-developed mathematics. I take it that this is a different charge from the alleged unintelligibility of true contradictions. In this paper, I examine the nature of logic in order to understand the view held by Cresswell and Putnam. I then show that, just as one can 'make sense of' non-normal modal logics (as Cresswell demonstrates), we can 'make sense of' paraconsistent logic. Finally, I turn the tables on Cresswell and Putnam and ask what sense we can make of explosive reasoning. While I acknowledge a bias on this issue, it is not clear that even classical logicians can answer that question.

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Imagine a series of theories $\mathsf{T}(\mathsf{i})$, where i indicates a particular stage in, e.g., a temporal development. Let T be the "limit" (to be specified) of this series. Is the situation imaginable where, for every i, $\mathsf{T}(\mathsf{i})$ is inconsistent with T? The positive answer to this question will be illustrated with specific examples.

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The logic $\mathbf{CL}^{-}$ is discovered by D. Batens as an unexpected result of a procedural approach to propositional **CL**. If the rule Ex Falso Quodlibet (EFQ) is removed from the procedural system, all **CL**-consequences of consistent premise sets remain derivable, and EFQ does not become a derived rule. The resulting consequence relation is paraconsistent, monotonic and reflexive, but not transitive. I have elaborated a regular axiomatization and a deterministic semantics for it. I will present this together with a new simple fitch style rule system for a predicative version of the logic. I will argue that this logic is a valuable paraconsistent alternative to classical logic (**CL**) as a general purpose reasoning tool. I will present the advantages of $\mathbf{CL}^{-}$, by comparing it to two typical classes of logical approaches to paraconsistency. The first is the class of logics that invalidate some crucial intuitive classical logic rule(s). These logics are philosophically interesting but too strict to formalize e. g. mathematical reasoning (where the application of the omitted rules is judged to be unproblematic). The second is the class of non-monotonic paraconsistent logics, such as adaptive logics. They are ideal instruments to explicate human reasoning processes that aim to diagnose inconsistent theories by localizing the inconsistencies, but the actual consequence relations cannot serve as a realistic means to replace **CL** because their non-monotonicity makes them far more complex than **CL**.

[1] Research for this paper was supported by subventions from Ghent University and from the Fund for Scientic Research – Flanders.

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Assuming only the axioms of comprehension and extensionality, here are derived basic properties of ordinal and cardinal numbers using the weak, intensional paraconsistent logic DLQ. Main results include the axioms of ZFC, Burali-Forti's paradox, Cantor's theorem, the existence of inaccessible cardinals and even insight into the generalized continuum hypothesis. *Dialethic paraconsistency*, the thesis and method by which some contradictions are true without absurdity, has so far struggled with perhaps *the* true but inconsistent theory. This paper shows that not only is there an interesting paraconsistent set theory to be studied; the theory is not revisionary, making for the following more general fact: It is possible to maintain the theorems of familiar classical mathematics while also admitting some paradoxes. The assumption of consistency is unnecessary. The fundament of standard mathematics can be non-trivially inconsistent. The paradoxes, in fact, provide more elegant routes to well-known theorems, as well as fertile sites for new discoveries. The work here effects the classical recapture conjectured for three decades, and provides a completely paraconsistent toolkit for quantitative science.

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The paper deals with the relativistic time-like dimension which should be a superposition of all moments of time positioned on a space-like line and taken *at the same time* in a same way as the spatial points are taken to form space-like line. If we take the straight light propagation then from the perspective of a subjective Newtonian spacetime we have a line, but *from the light perspective* (inertial frame of reference moving with the speed of light) we will have of all moments of time appear at the same time. If this reasoning is applied to the Poincaré's clock which defines time then displacements $\frac{1}{2}$ct, $-\frac{1}{2}$ct occur at the same time, which is denoted $[\frac{1}{2}\mathsf{ct} - \frac{1}{2}\mathsf{ct}]$ and also by $\uparrow\downarrow$ ($\uparrow = \frac{1}{2}$ct; $\downarrow = -\frac{1}{2}$ct). Such displacements are equivalent to $\frac{1}{2}$ct and $-\frac{1}{2}$ct occurring forward and backward in time so the time-like dimension can be a superposition of two inversely orientated axes. The analysis of Poincaré's clock from the perspective of subjective Newtonian spacetime supports the claim that apart of normal sequential way $\frac{1}{2}ct$ and $-\frac{1}{2}ct$ also occur at the same time. In its own time the light ray travels non-zero distances $\frac{1}{2}ct$ and $-\frac{1}{2}ct$ at the same time.

$\uparrow\downarrow$ is a union of two opposite vectors similar to a quantum superposition state of two spin values. Numerically it can represent amplitude of probability therefore it can be a subject to algebraic operations.

For our concept of time-like dimension it must be: $(\uparrow\downarrow)^2 = -(ct)^2$. A chemical analogy may be helpful. We treat $\uparrow\downarrow$ as something like a chemical compound formed by the *reaction* $\uparrow\downarrow = \uparrow \bullet + \bullet \downarrow$ where $\bullet$ representes an *unsaturated* bond. We assume that $(\uparrow \bullet \times \bullet \downarrow) = -(ct)^2/4$ and: $\uparrow\bullet = -\bullet\uparrow$ and $\uparrow\bullet = -\downarrow\bullet$. Now $(\uparrow\downarrow)^2 = (\uparrow \bullet + \bullet \downarrow) \times (\uparrow \bullet + \bullet \downarrow) = (\uparrow \bullet \times \uparrow\bullet) + (\uparrow \bullet \times \bullet \downarrow) + (\bullet\downarrow \times \uparrow\bullet) + (\bullet\downarrow \times \bullet\downarrow)$. $(\bullet\downarrow \times \uparrow\bullet) = (\uparrow \bullet \times \bullet \downarrow) = -(ct)^2/4$ and $(\bullet\downarrow \times \bullet\downarrow) = -\downarrow \bullet \times \bullet \downarrow = \uparrow \bullet \times \bullet \downarrow = -(ct)^2/4$. Thus in sum: $(\uparrow\downarrow)^2 = -(ct)^2$ or: $[\frac{1}{2}ct, -\frac{1}{2}ct]^2 = -(ct)^2$ which is equivalent to $ict = [\frac{1}{2}ct, -\frac{1}{2}ct]$, which after division by ct (justified by considering k-times larger or smaller Poincaré's clocks) gives is equation: $i = [\frac{1}{2}, -\frac{1}{2}]$. The imaginary number i is then a scalar entity with the ordered pair of values $\frac{1}{2}$ and $-\frac{1}{2}$ assigned to it, which seems to be a contradiction. Under certain assumptions the same equation can be derived from Quantum Mechanics.

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A common complaint against reasoning based on maximal consistent subsets (proposed by Rescher) is that it is too sensitive to the underlying syntax of the logical representation – a minor syntactic variant may yield wildly different conclusions. In [1], Belnap considered a strategy to improve the Rescher-mechanism by finding different *articulations* for a set of logical descriptions. Belnap's main idea is that given a set of input premises Γ we can *pre-process* Γ with certain closure operations so that the *content* of the input premises can be made explicit and information not involved in any inconsistency can be isolated. Once this is completed, we can then apply the Rescher-mechanism to reason with the extended set. On this approach, reasoning can be viewed as a two stage process involving both preparation of data and formal deduction from prepared data.

In [2], Belnap proposed the use of Angell's analytic containment to amend Rescher's strategy for reasoning with maximal consistent subsets. In [3] Belnap made a further amendment to his earlier amendment by using an even more restrictive non-classical logic based on the idea of *conjunctive containment*. More recently in [4], Horty explicitly endorsed Belnap's second amendment to address a related problem in handling inconsistent instructions and commands. We'll examine Belnap's amendments and point out that Belnap's suggestion in the use of conjunctive containment is open to the very objection he raised – namely it over generates disjunctive information which can behave badly in the presence of inconsistencies. We'll propose a way out – our strategy turns on the use of Belnap's notion of *First Degree Entailment* in combination with Quine's notion of *prime implicate* ([5, 6, 7]).

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The essence of Thomas Bradwardine's theory of truth consists in the claim that an utterance is true (if and) only if everything the utterance says is the case. The essence of his solution to the Liar paradox flows from this, and consists in the claim that a Liar utterance is false as, in addition to its saying of itself that it is false, it also says of itself that it is true, and so, by contravalence (no utterance is both true and false), not everything it says is the case. What we may call 'Bradwardine's theorem' in turn establishes on the basis of Bradwardine's definition of truth that the Liar utterance does say of itself that it is true.

I propose to focus on Stephen Read's [1] careful reconstruction of the proof of Bradwardine's theorem. As it stands, the proof crucially uses *modus ponendo tollens*, a rule of inference that is inadmissible in many paraconsistent logics. In the main part of the paper, I will study the conditions under which the conclusion of the theorem can be expected to be had in the technical framework of the (simplified) possible-world semantics for relevant logics. I will assume the constraints on the accessibility relation characterizing the well-known system **R**. The standard semantic structures will have to be modified with an extra accessibility relation for the saying-that operator and with definitions of propositions and operations on them (both extensional and intensional). In this framework, I will first offer two semantic proofs of the conclusion of the theorem and argue that both of them are highly problematic either in some modelling assumption about conjunction or in the use of an implausibly strong principle of hyperconstancy of saying-that. They do suggest however a better non-constructive proof to the effect that, for some Q, the Liar utterance λ says both that [Q and λ is false] and that [it is not the case that [Q and λ is false]], and so, by the law of non-contradiction (for every P, it is not the case that [P and it is not the case that P]), not everything it says is the case. The proof makes use of a weak principle of closure of saying-that under (*ut nunc*) logical consequence and of a reasonable principle of constancy of saying-that. I will defend the claim that, from a relevant perspective, even though being non-constructive and falling short of establishing anything as strong as Bradwardine's theorem, the proof preserves much of what is valuable in it.

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