

Young Researchers Days in
Logic, Philosophy and History of Science

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LOGIC

Richard Dietz (KUL) :
On Weatherson on Generalising Kolmogorov

Abstract :

Kolmogorov's calculus of classical probability (as formulated for languages of propositional logic) says that (i) probability functions take values in the unit interval, (ii) that they respect logic (i.e. P assigns to tautologies the value one, to classical contradictions the value zero, and if $\{A\}$ classically entails B , then $P(A) \leq P(B)$), and (iii) that they satisfy general additivity (i.e. $P(A \vee B) = P(A) + P(B) - P(A \wedge B)$). In his "From classical to constructive probability" (2003), Brian Weatherson offers a generalisation of Kolmogorov's probability calculus that is neutral regarding the logic for the object-language. The generalised calculus implies not only respect of probability for logic but also the general additivity constraint, *whatever* logic we may adopt. I argue that Weatherson's notion of generalised probability is inadequate. For a case in point, I show that it runs into serious trouble if it is applied to *supervaluationist* logic (Fine (1975)). Call a degree of belief distribution on a language *dogmatic* with respect to a logically contingent sentence iff it takes either the upper bound (1) or the lower bound (0) as value. It turns out that supervaluationist generalised probability requires coherent degree of belief distributions to be dogmatic with respect to any sentences of the form 'it is vague whether P ', also if these sentences are logically contingent. As a consequence, we cannot have a partial positive degree that a sentence is vague, on pain of incoherence. The problem is *not* that we are to be dogmatic with respect to some logically contingent sentences (this follows also on classical probability on certain provisos Williamson (2007)), *nor* is the problem that for some logically contingent sentences, we are to be dogmatic with respect to them (the Dutch-Book argument strategy may be employed in favour of a strong dogmatism (Milne 1991)). The problem is that the strong dogmatism imposed by Weatherson's notion of probability lacks any underpinning in the form of an interpretation of degree of belief and something that would come to a soundness argument. Weatherson makes avail of the Dutch Book argument strategy in support of the intuitionist version of generalised probability. But this strategy is of no avail for motivating the supervaluationist version of generalised probability. On the contrary, it can be employed for vindicating different supervaluationist notions of probability – in any case, respect for logic and/or general additivity are to be abandoned. I discuss different options of generalising classical bets to supervaluationist frameworks: (a) conditional bets (Cantwell (2006)), (b) unconditional bets with graded pay-offs (Milne (2007)) and (c) unconditional bets with ungraded pay-offs (Dietz (2008)). Supervaluationist probabilities are in either case specifiable in terms of classical probability, as (a') conditional probabilities of truth given a truth-value, as (b') expected truth-values, or as (c') probabilities of truth respectively. It is suggested that for supervaluationist logic, the third option is the most attractive one, for (unlike the other options) it preserves respect for logic.

References :

- CANTWELL, JOHN (2006): "The laws of non-bivalent probability", *Logic and Logical Philosophy*, **15**, 163-71.
 DIETZ, RICHARD (2008): "Betting on borderline cases", to appear in *Philosophical Perspectives*.
 FINE, KIT (1975): "Vagueness, truth and logic", *Synthese*, **30**, 265-300.
 MILNE, PETER (1991): "A dilemma for subjective Bayesians – and how to resolve it", *Philosophical Studies*, **62**, 307-14.
 ———(2007): "Betting on fuzzy and many-valued propositions: Dutch-Book arguments applied to additive fuzzy and many-valued logics", MS, August 15, 2007.
 WEATHERSON, BRIAN (2003): "From classical to constructive probability", *Notre Dame Journal of Formal Logic*, **44**, 111-23.
 WILLIAMSON, TIMOTHY (2007): "How probable is an infinite sequence of heads?", *Analysis*, **67**, 173-80.

Salima Djerrah (UCL) :

Le principe de contradiction est-il un principe logique ?

Abstract :

Dans son célèbre livre de 1910 *Du principe de contradiction chez Aristote*, l'éminent logicien polonais de l'école de Lvov-Varsovie (1878-1956) appelle à une révision profonde du principe de contradiction comme il s'est présenté chez Aristote.

Ainsi, faisant la distinction dans l'histoire de ce principe entre trois grands moments :

- a) Le combat d Aristote contre les sophistes
- b) La contestation hégélienne du principe
- c) L'examen actuel (en 1910) posant la possibilité d'une « logique non aristotélicienne»

Lukasiewicz considère que ce dernier moment s'impose d'une manière nécessaire semblable à celle qui a concerné dans le domaine de la géométrie la question de l'axiome des parallèles.

Nous proposons ici un résumé de cette lecture qui à partir de cette troisième étape tâche de discuter minutieusement le livre Γ de la *Métaphysique* d'Aristote et de présenter les réponses possibles aux questions suivantes :

- 1- Pourquoi Aristote refuse-t-il catégoriquement la possibilité de rejeter successivement les principes logique et ontologique de contradiction ?
- 2- Pourquoi insiste-t-il sur l'indémontrabilité du principe et le démontre quand même à partir de cinq preuves différentes ?
- 3- Quelles sont les plus importantes erreurs commises dans ces preuves ?
- 4- Quelle est la relation du principe de contradiction avec les autres principes logiques ?
- 5- Enfin, quelle est la vraie valeur du principe de contradiction ?

Toutefois, nous essaierons à travers cette lecture Lukasiewiczienne de dégager quelques conséquences épistémologiques et logiques essentielles pour le développement ultérieur du problème des fondements des principes logiques.

Laurent Dubois (ULB) :
Lambda Theory

Abstract :

The purpose of this contribution is to analyse the immediate consequences of the introduction of a constant for the void into a first-order language and into set theory. One will take the theory ZFC as a point of reference. Any set theory could be used, but we chose the standard axiomatic set theory. One will see that the introduction of the Lambda constant into a first-order language makes it possible to highlight a zero-order logic different and probably more legitimate than the propositional logic, to build the empty set from the void by means of the axiom of the parts, and to solve the anomaly of the intersection of an empty collection (family). On a conceptual level, taking into account the Lambda constant makes it possible to redefine the concept of set and to give a status of emblematic set to the empty set.

Jan Heylen (KUL) :
Carnapian Arithmetic with Descriptions

Abstract :

The most distinctive feature of (the semantics for) Carnapian modal predicate logic consists in the fact that the variables range over individual concepts, i.e. functions from possible worlds to individuals, rather than over individuals simpliciter. As a consequence, substitution of identicals is no longer truth-preserving across the board. For modal-free contexts substitutivity of identical individuals is retained, but for modal contexts substitutivity can be upheld only for identical individual concepts. One can extend the logic with descriptions by using the following contextual definition:

$$G(\iota x F(x)) =_{df} \exists x(F(x) \wedge \forall y(F(y) \rightarrow y = x) \wedge G(x)) \vee (\neg \exists! x F(x) \wedge G(a^*))$$

Føllesdal famously argued in his doctoral dissertation (Referential opacity and modal logic, Harvard University, 1961) that one gets a modal collapse in the resulting logic. One of his arguments made essentially use of the necessity of identity, which is an invalid principle in Carnapian modal predicate logic. I will show that, if one extends Carnapian modal predicate logic with Peano Arithmetic as it is usually formulated, the necessity of identity is a theorem notwithstanding its invalidity in the pure logic. So Carnapian Peano Arithmetic with descriptions faces a collapse, although it is a consistent theory. Furthermore I will prove that the principle of induction, which is essential to the axiomatic theory of Peano Arithmetic, is invalid as it stands. There is however an alternative formulation of the induction principle which is valid. Moreover, I will substantiate the claim that there is no collapse forthcoming for the resulting alternative theory of Carnapian arithmetic. To be more precise, there is at least one model in which the following is true :

$$(1) \exists x(F(x) \wedge \neg \Box F(x))$$

So far, so good, but Horsten has in a recent publication (“Canonical Naming Systems”, *Minds and Machines*, vol. 15 (2005), no. 2, pp. 229-257) spelled out a paradoxical argument which has as its starting point the necessity of the above. I will critically assess this argument and in the process I will discuss the (in)validity of a couple of description principles which allow for self-predication, i.e. the inference of $\varphi(\iota x \varphi(x))$, the (in)validity of the least number principle as it is usually formulated and an alternatively formulated least number principle, and the (im)possibility of inferring $\exists x \Box \varphi(x)$ from $\Box \exists x \varphi(x)$. If time permits, I will apply lessons learnt to Carnapian epistemic logic.

Hans Lycke (UGent) :
The Adaptive Logics Approach to Abduction

Abstract :

Abduction in Logic. When searching for an explanation for a (puzzling) phenomenon, people often reason backwards, from the phenomenon to be explained to possible explanations. When they do so, they perform abductive inferences, inferences based on the argumentation schema known as Affirming the Consequent:

[AC] $A \supset B, B \vdash A$

As AC is not deductively valid, most logic-based approaches characterize abduction as a kind of *backwards deduction plus additional conditions*. This means that a number of conditions is specified that enable one to decide whether or not a particular abductive inference is sound (one of those conditions may for example be that an abduced formula should be compatible with the background theory). But, although these approaches succeed in specifying which formulas may count as valid consequences of abductive inference steps, they do not explicate the way in which people actually reason by means of abductive inferences. This is most clearly shown by the absence of a decent proof theory. Moreover, also the search procedures that are provided to obtain the right abductive consequences — for example, the tableaux methods presented in Aliseda-Llera [1] —, do not by far resemble human reasoning.

The Adaptive Logics Approach. In this paper, I will show that abductive reasoning processes are better explicated by making use of adaptive logics.¹ In order to do so, I will present the adaptive logics AbL^r_1 and AbL^r_2 . Proof theoretically, both interpret AC as a defeasible rule of inference. This means that the consequences obtained by applying AC are accepted only for as long as there is no reason to reject them (for example, as long as their negation hasn't been derived from the background theory). As a consequence, AbL^r_1 and AbL^r_2 retain the unproblematic applications of AC, while rejecting the problematic ones. In this way, they nicely capture the way in which people do reason by means of abductive inferences. Moreover, as both adaptive logics explicate different kinds of abduction, it is shown that the adaptive logics approach is not restricted to a particular kind of abduction, but can be applied to explicate multiple kinds of abduction processes. Concerning AbL^r_1 and AbL^r_2 , the difference between both comes down to the following: in case there are multiple possible explanations for a phenomenon, AbL^r_1 will only allow to derive the disjunction of the possible explanations (practical abduction), while AbL^r_2 will allow to derive all possible explanations (theoretical abduction).

References :

- [1] ATOCHA ALISEDA-LLERA. Abductive Reasoning. Logical Investigations into Discovery and Explanation, volume 330 of Synthese Library. Kluwer, Dordrecht, 2006.
- [2] DIDERIK BATENS. A general characterization of adaptive logics. *Logique et Analyse*, 173–175:45–68, 2001 (Appeared 2003).
- [3] DIDERIK BATENS. A universal logic approach to adaptive logics. *Logica Universalis*, 1:221–242, 2007.

Julien Maréchal (UCL) :

How to Contextualize: Some Simple, Some Complicated Ways

Abstract :

This paper focuses on the gap separating *parametric* and *occasion-sensitive* approaches to linguistic content. Its goal is to defend an agent-perspective in resorting to context. Parametric approaches presents us with a plurality of forms of context-sensitivity in order to systematically accommodate variations of content and truth-value of sentences across contexts. However, occasion-sensitivity pervades all such context-sensitivity cases and inflates uncontrollably the list of relevant parameters. First, I sketch a classification of such forms of context-sensitivity showing at which points occasion-sensitivity might enter the picture. More specifically, I consider recent proposals to include fine-grained forms of contextualism (such as “non-indexical contextualism” and “relativism”) and their response to the challenge posed by occasion-sensitivity. Second, I outline an argument supporting occasion-sensitivity against their response and discuss how it is troublesome for the parametric approach. Finally, I show a few ways in which the above discussion affects the semantics-pragmatics interface debate.

Francesca Poggiolesi (VUB) :
Two Cut-free Sequent Calculi for Modal Logic S5

Abstract :

Amongst the many normal systems of modal propositional logic, one of the most important and well-known is doubtlessly S5. When considered from the point of view of Kripke semantics, S5 is quite a peculiar system since it can be described in two different but equivalent ways. The first one specifies the properties that the accessibility relation between worlds of a Kripke frame should satisfy: S5 is indeed sound and complete with respect to the class of reflexive, transitive and symmetric frames (or, equivalently, with respect to the class of reflexive and euclidean frames). A second and easier way to study S5 semantically exploits Kripke frames where the accessibility relation is absent: S5 is indeed sound and complete with respect to the class of frames which are just non-empty sets of worlds.

Unfortunately so much cannot be said of the syntactic level; on the contrary it turns out to be quite a challenge to give a sequent calculus for this system. The efforts in this direction are numerous and each of them presents some difficulties. The most common fault of the sequent calculi proposed so far consists in not being cut-free (Blamey and Humberstone (1991), Matsumoto and Ohnishi (1959)) or, anyway, in not satisfying the subformula property (Negri (2005), Sato (1980)). Other Gentzen calculi are syntactically impure because they use explicit semantic parameters (Brauner (2000), Cerrato (1993), Mints (1997)), some others are in a certain sense incomplete, since either they can only treat S5 as a system whose accessibility relation satisfies several conditions (Dosen (1985), Indrezejczak (1997), Wansing (1994)), or they can only treat S5 as a system where the accessibility relation is absent (Avron (1996)).

Our goal in this talk is to present a method, called the tree-hypersequent method (Poggiolesi (2008)), which allows us to construct two different sequent calculi for S5, each of which naturally reflects one of the ways of describing S5 semantically. We will show that both sequent calculi are valid and complete and that are contraction-free and cut-free. Moreover the one which corresponds to the S5 semantic variant where the accessibility relation is absent, will happen to be unusually simple.

References :

- Avron, A. (1996). *The method of hypersequents in the proof theory of propositional non-classical logic*. In W. Hodges, M. Hyland, C. S. e. J. S., editor, *Logic: from foundations to applications*, pages 1-32. Oxford University Press.
- Blamey, S. and Humberstone, L. (1991). *A perspective on modal sequent logic*. Publications of the Research Institute for Mathematical Sciences, Kyoto University, 27:763-782.
- Brauner, T. (2000). *A cut-free gentzen formulation of the modal logic S5*. *Logic Journal of the IGPL*, 8:629-643.
- Cerrato, C. (1993). *Cut-free modal sequents for normal modal logics*. *Notre-Dame Journal of Formal Logic*, 34:564-582.
- Dosen, K. (1985). *Sequent systems for modal logic*. *Journal of Symbolic Logic*, 50:149-159.
- Indrezejczak, A. (1997). *Generalised sequent calculus for propositional modal logics*. *Logica Trianguli*, 1:15-31.
- Matsumoto, K. and Ohnishi, M. (1959). *Gentzen method in modal calculi*. *Osaka Mathematical Journal*, 11:115-120.
- Mints, G. (1997). *Indexed systems of sequents and cut-elimination*. *Journal of Philosophical Logic*, 26:671-696.
- Negri, S. (2005). *Proof analysis in modal logic*. *Journal of Philosophical Logic*, 34:507-534.
- Poggiolesi, F. (2008). *The method of tree-hypersequent for modal propositional logic*. In Makinson, D., Malinowski, J., and Wansing, H., editors, *Trends in Logic: Towards Mathematical Philosophy*. Springer, forthcoming.
- Sato, M. (1980). *A cut-free gentzen-type system for the modal logic S5*. *Journal of Symbolic Logic*, 45:67-84.
- Wansing, H. (1994). *Sequent calculi for normal modal propositional logics*. *Journal of Logic and Computation*, 4:125-142.

Giuseppe Primiero (UGent) :
Constructive Modalities for Information

Abstract :

In recent research [7], a yet uncovered intersection of topics has been suggested concerning the epistemic interpretation of constructive modalities and the description of corresponding epistemic states in terms of a well-defined notion of information. This results in a logical definition of the notion of information in terms of constructive modalities.

With respect to this topic, the constructive interpretation of dependent (or hypothetical) judgements is crucial. One describes a provability predicate as the basic constraint on truth, and then identifies the main role of the dependency relation on justifications. The very relevant meaning of this class of judgements was already stressed by Brouwer for intuitionistic languages, and it has recently been investigated in [8] for a large class of intuitionistic and constructive logics. With respect to this class of formal judgements, we consider the notion of explicit provability as introduced e.g. in [1] and the related connection to modalities. For information theories this opens to a specific reading of epistemic states: in a logic for *being informed* (see [3]), truth can be defined as verified information, interpreted under the formal treatment of constructive necessity; on the other hand, the dynamics on dependent judgements reflects operations of *becoming informed* ([5], [6], [7]), corresponding to a subclass of modal judgements identified with the B-core of a KTB normal modal logic and formalised in terms of constructive possibility operators. The main theoretical effect is that veridicality is rejected for infons, because their formal counterparts acquire truthfulness only under explicit substitution procedures (see also [4]). In this way, it is also possible to provide an interpretation of forms of defeasible reasoning in this constructive language.

In this talk, these constructive modalities for information are introduced: the language L^{CTT} can be defined both syntactically and semantically, via a direct correspondence to the syntactic-semantic method of Constructive Type-Theory a la Martin-Löf. A common translation to an intuitionistic sequent calculus extended with modal operators called $(I)LJkb$ is the bridge to modalities. In the second part of the talk, I will investigate a first possible extension: a new sequent calculus $(I)LJkb^+$, extended with multi-modalities in the antecedents, in order to simulate multi-agents information processes. The main reason for this extension is to give a precise constructive formulation of the notion of collective knowledge. I will in the end mention the use of intuitionistic sequent calculi with (modal) multi-consequents (see [2]). An explanation of the intuition behind this possible formalization will be given.

References :

- [1] S. Artemov. Explicit provability and constructive semantics. *Bulletin of Symbolic Logic*, 7(1):1-36, 2001.
- [2] V. de Paiva and L.C. Pereira. A short note on intuitionistic propositional logic with multiple conclusions. *Manuscrito - Rev Int. Fil. Campinas*, 28(2):317-329, 2005.
- [3] L. Floridi. The logic of being informed. *Logique & Analyse*, 196:433-460, 2006.
- [4] N. Ghani, V. de Paiva, and E. Ritter. Explicit substitutions for constructive necessity. In *Proceedings of the 25th International Colloquium on Automata, Languages and Programming*, volume *Lecture Notes In Computer Science*; Vol. 1443, 1998.
- [5] G. Primiero. An epistemic constructive definition of information. *Logique & Analyse*, 50(200):391-416, 2007.
- [6] G. Primiero. *Information & Knowledge*, volume 10 of *Logic, Epistemology and the Unity of Sciences*. Springer, 2008.
- [7] G. Primiero. An epistemic logic for becoming informed. *Knowledge, Rationality and Action*, forthcoming.
- [8] Mark van Atten. On the hypothetical judgement in the history of intuitionistic logic. In *Proceedings of the LMPS 2007 Conference*, Beijing, forthcoming.

Sébastien Richard (ULB) :

The Problem of the Formalisation of Husserl's Theory of Parts and Wholes

Abstract :

In his third *Logical Investigation* Edmund Husserl sketched a theory of the pure forms of wholes and parts. In a series of definitions and theorems he tried to formalise the important concept of ontological dependency and its relations to the problem of the unity of objects. Although this theory was formal, it was not symbolised by the later founder of Phenomenology. If Husserl did not fulfil this task himself, he considered that his theory should receive a mathematically deductive form and so be given the exact form of science. In this paper we would first like to present this theory which has been neglected for a long time by scholars and secondly to consider the possibility of its formalisation in modern logical terms. In this second perspective, the main proposal, made by Kit Fine, is to reconstruct, in an axiomatic way, Husserl's theory in term of mathematical topology. We would like to analyse it, to show how it fails to capture Husserl's theory and make some proposals to correct it.

Damien Servais (UCL) :
Les cardinaux ambigus

Abstract :

E. Specker a montré en 1963 que la consistance de NF (les New-Foundations de Quine) se ramène à l'existence d'un modèle ambigu de TT (la Théorie des Types).

Il s'agira premièrement de motiver la définition et l'étude des cardinaux ambigus (ceux qui engendrent naturellement un modèle ambigu de TT) à partir de NF et de ses fragments. Nous nous focaliserons par la suite sur diverses formalisations de l'ambiguïté dans le système plus rassurant de ZF.

Dunja Seselja (UGent) :
An Adaptive Logic Framework for Abstract Argumentation
(Joint work with Christian Strasser)

Abstract :

The paper presents an adaptive logic framework for abstract argumentation. It consists of a basic logic for abstract argumentation and various “enhancements” of it. These logics represent in an accurate sense the most common extensions defined in view of Dung’s abstract argumentation system [4]. By “enhancements” of the basic system is meant, on the one hand, the addition of axioms, and on the other hand, adaptive logics having this logic as their lower limit logic. In this way we are able to gain logics, the models of which correspond exactly to specific extensions of given argument systems, but also a handy proof theoretic notion of e.g. the so-called sceptical and credulous reasoner. The proposed system provides not just a strong unifying logical framework for the standard extensions of Dung’s abstract argumentation system, but is also easily extensible to various generalizations, such as those allowing for joint attacks [5] or the integration of preferences, audiences, and values (cp. e.g. [1], [3], [2]).

References :

- [1] Leila Amgoud and Claudette Cayrol. On the acceptability of arguments in preference-based argumentation. In Gregory F. Cooper and Serafn Moral, editors, UAI, pages 1–7. Morgan Kaufmann, 1998.
- [2] Trevor J. M. Bench-Capon. Value based argumentation frameworks. CoRR, cs.AI/0207059, 2002. informal publication.
- [3] Trevor J. M. Bench-Capon, Sylvie Doutre, and Paul E. Dunne. Audiences in argumentation frameworks. *Artificial Intelligence*, 171(1):42–71, 2007.
- [4] Phan Minh Dung. On the acceptability of arguments and its fundamental role in nonmonotonic reasoning, logic programming and n-person games. *Artificial Intelligence*, 77:321–358, 1995.
- [5] Søren Holbech Nielsen and Simon Parsons. A generalization of dung’s abstract framework for argumentation: Arguing with sets of attacking arguments. In *ArgMAS*, pages 54–73, 2006.

Christian Strasser (UGent) :

An Adaptive Logic for Conditional Obligations and Deontic Dilemmas

Abstract :

Recent work in adaptive logics has shown growing interest in (monadic) deontic systems which are able to deal with deontic dilemmas (cp. [4], [5], [6]). Unlike standard deontic logic (SDL), Goble's logic DPM (cp. [2], [1]) prevents deontic explosions in cases with conflicting obligations by means of restricting the inheritance principle (if $\vdash A \rightarrow B$ then $\vdash OA \rightarrow OB$), 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 (cp. [6]). It is well known that attempts to model conditional obligations in terms of monadic ought-operators (e.g. $O(A \rightarrow B)$ or $A \rightarrow OB$) have several shortcomings. This has led to various approaches based on dyadic ought-operators $O(A/B)$ – “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’ ($O(A/B) \rightarrow O(A/B \wedge C)$) has to be restricted. Paradigmatical instances are settings in which exceptions and/or violations of general obligations occur, like for example (cp. [3]):

(i) You ought not to eat with your fingers: $O(\neg F/\top)$

(ii) You ought to put your napkin on your lap: $O(N/\top)$

(iii) If you are served asparagus, you ought to eat it with your fingers: $O(F/A)$

Goble's logic CDPM (cp. [1]) is able to derive all the desired obligations (e.g. $O(F/N \wedge A)$, $O(N/A)$), while blocking unwanted ones (e.g. $O(\neg F/A)$). Nevertheless, replacing (iii) with $P(F/A)$ 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.

References :

[1] Lou Goble. Dilemmas in deontic logic. To appear.

[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.

PHILOSOPHY OF SCIENCE

Rogier De Langhe (UGent) :
Trading off explanatory virtues

Abstract :

It is argued that models for the study of complex, multi-faceted phenomena such as the Cuban Missile Crisis cannot simultaneously maximize explanatory desiderata such as generality and precision. As a consequence, explanatory desiderata need to be traded off against each other. It is the existence of these tradeoffs, together with the fact that on the one hand different models provide different ways to trade off explanatory desiderata and, on the other hand, different explanatory requests require a different way of trading off, which leads to the conclusion of this paper that models should not to be reduced but rather valued for their different perspectives. In order to give substance to this claim, I will outline a framework in which explanations can be positioned according to their respective levels of generality and precision. It is then shown how the erotetic model of explanation can be brought to bear on this framework, enabling the framework to also represent the generality and precision needs of different explanatory requests. As such, it is possible to indicate, both practically and theoretically, the way in which Allison's different models answer different questions and have an irreducible role in explanatory practice. A view on models is proposed which holds that a model is one possible answer to the question of how to tradeoff precision and generality. A model strives to optimize the combination of precision and generality for a given (cluster of) question(s).

Isabelle Drouet (UGent) :
Probabilistic Theories and Levels of Causality

Abstract :

Although there exists a debate on the nature of their relationship, generic causation and singular causation are nowadays commonly distinguished. A noticeable difference between these two levels of causality is that probabilistic theories naturally fit generic causality, whereas singular causality does not admit any uncontroversial probabilistic analysis. Thus, an appealing position seems to be as follows: generic causality can be given a probabilistic analysis but singular causality cannot. This position was defended in particular by E. Sober.

The aim of my paper is to examine how this position articulates available analyses of the relationship between levels of causality. More precisely, I identify three basic accounts of the relationship between generic and singular causation, provide a short discussion of each of them and examine whether they are compatible with the idea that only generic causation (and not singular causation) can be given a probabilistic analysis. My conclusion will be that none of the three identified basic accounts is compatible with this idea.

Steffen Ducheyne (UGent) :

Kant and Whewell on Bridging Principles between Metaphysics and Science

Abstract :

In this essay, I call attention to Kant's and Whewell's attempt to provide bridging principles between *a priori* principles and scientific laws. Part of Kant's aim in the *Opus postumum* (ca. 1796-1803) was precisely to bridge the gap between the metaphysical foundations of natural science (on the *Metaphysical Foundations of Natural Science* (1786) see section 1) and physics by establishing *intermediary concepts* or 'Mittelbegriffe' (henceforth this problem is referred to as 'the bridging-problem'). I argue that the late-Kant attempted to show that the concept of 'moving force', an intermediary concept derived from *a priori* principles, could be given empirical content so that concrete scientific knowledge is arrived at. Thus, the late-Kant wished not only to show that proper scientific laws are necessary *a priori* (as he had shown in the *Metaphysical Foundations of Natural Science*) but also that intermediary concepts could be derived from *a priori* principles which, when interpreted empirically, resulted in the specific forces as established by physics (see section 2).

Of course, William Whewell never knew about Kant's *Opus postumum* and his attempt to bridge the gap between the metaphysical foundations of science and physics. However, it is striking that Whewell had similar concerns about the *Critique of Pure Reason* and the *Metaphysical Foundations of Natural Science* as Kant himself. According to Whewell, the Kantian project was incomplete because it did not show how 'modifications' (in the sense of concretizations) of *a priori* principles could result in empirical laws (section 3). Next, it will be argued, by taking into account several of Whewell's philosophical notebooks which have scarcely been studied systematically, that Whewell's doctrine of Fundamental Ideas grew out of his dissatisfaction with the Kantian project with respect to the bridging problem and that his own philosophical position should be seen as an attempt to bypass the bridging-problem.

Nathalie Gontier (VUB) :

The Representational Approach in Language Origin Studies

Abstract :

In evolutionary linguistics and evolutionary archaeology, an increasing group of scholars endorse that language evolution runs parallel with the evolution towards more complex tools. Authors such as Ambrose, Mellars, Mithen, etc.) assess that composite tools reflect aspects of grammar such as rule-governed behaviour. This in turn requires reflexivity and recursion.

Simple tools made up of only one piece, typical for the Oldowan and the Acheulean, are on the contrary argued to reflect the absence of grammar. Rather, hominins that produce Oldowan and Acheulean tools are argued to have possessed a Bickertonian, lexical-based protolanguage. With this protolanguage words are assigned to different, standardized tools such as the Acheulean biface. In other words, the rise of protolanguage is nowadays often associated with the rise of standardized tools.

In this paper the philosophical, cognitive and anthropological assumptions that found these ideas are the subject of examination. The general idea behind the theories that associate simple tools with protolanguage and complex, composed tools with grammar are the following. If tool standardization is present, the latter implies that the maker had a concept or representation of the tool he was making in mind, which he could then label verbally. Clear tool types (at least one: the biface), originate from the Acheulean onwards and first appeared with *Homo erectus* and *Homo heidelbergensis*. Thus, these species are argued to have evolved protolanguage.

Intentional shaping of tools is therefore related to intentionality *tout court* and the latter is required (to a greater or lesser extent) for the manufacture of tools, the labelling of tools and for communication altogether.

These authors, probably unconsciously, therefore relate their ideas to the, what I call, representational approach to cognition, that first originated in philosophy of mind studies (see e.g. Dennett, 1998 for an overview).

This is the discipline where books are filled with pictures of the following kind, fig. 1): a thing in the environment causes a representation in the mind which is then labelled verbally. Memory in turn allows us to remember the thing without its presence and imagination allows us to create things in our minds that do not (yet) exist, which we can then possibly manufacture intentionally. The mental representation and the word used to label that representation are, in this tradition, regarded as similar.

Nathanaël Laurent (FUNDP) :

Critical Approach of the Notion of Function and Attempt to Redefine the Limits of the Knowledge of the Living Beings

Abstract :

The purpose of my contribution is to apply the Kantian Critique to the notion of "function" such as it was defined by some philosophers of the biology in the 70s and 80s. Larry Wright's general definition of "function" (1973) supposes that reference to the effects of a biological trait helps to explain its presence in an organism. The trait is thus *selected for* that purpose. Ruth Garrett Millikan (1984) contributed to strengthen this definition by showing that "proper functions" are associated with reproduced or copied items, certain effects of whose ancestors have helped account for the survival, by continued reproduction, of the item's lineage. Biological traits have thus been selected for reproduction over actual competitors and become the *norm*. William Wimsatt (1972) insists on the fact that it is necessary to attribute "functions" to *behaviors* (to *do* something in a given context) and not to objects (even if it is objects and changes in objects that are observed). Robert Cummins's definition of "function" (1975) is no more historical as are the previous ones. His functional explanation explains the biological *capacities* of organisms, i.e. it explains *how* the organism's system works (now), rather than why the traits contributing to these capacities or workings are there.

Under an epistemological evaluation, these two kinds of functional explanation – one being called ethiological or teleological and the other causal or systemic – are made vague because of their confusing role: pragmatic and pedagogical, or realistic. Theoretical or heuristic uses of these explanatory structures are generally not well defined, what contributes to weaken them considerably. Presupposed ontology of the system's objects and relations between them becomes an obstacle when we want to cross from a scale of organization to another into the system, or from a static to a dynamic conception of this last one.

In this work, I will call back the Kantian important question about *What is it possible to us to know concerning living things?* and the answer which was given to it in 18th century. More exactly, the difference between *explanation* (to know organized beings by means of causale laws) and *understanding* (the necessary inscription of the knowledge about living beings into the finalist view which exceeds it), and between *reflective* and *determinant* judgments will be used to diagnose the possible error (as well as the *antinomy* which it would provoke) made by historical and systemic theories of function mentioned above.

To summarize, I thus suggest analyzing the *dogmatism* of certain current explanatory propositions proposed by neo-darwinians. Paradoxically, such propositions are not affected by the spatio-temporal contexts of the phenomena which are explained. To seize the evolution in its concrete temporal and spatial dimensions, then means returning the attention on the forms of life such as they appear to us in their infinite variety. Implications for the future of theories in biology will be also discussed.

Bert Leuridan (UGent) :

The IARC, Mechanistic Evidence and the Precautionary Principle

(Joint work with Erik Weber)

Abstract :

The IARC, the International Agency for Research on Cancer, is a division of the World Health Organisation that seeks to identify the causes of human cancer [1]. More specifically, it evaluates the evidence on the carcinogenicity of a wide range of agents (chemicals, etc.).

In this paper, I will briefly present the procedures and criteria used by the IARC, show that they are at odds with contemporary philosophical theories of causation (more specifically regarding the role of mechanistic evidence in establishing causal claims) and explore the ways in which these procedures and criteria could be defended by invoking some version of the precautionary principle.

How is the carcinogenic risk of exposures assessed by the IARC? The available evidence is divided into three different groups: *epidemiological studies*, *animal experiments* and information about *mechanisms*. The assessment consists of three phases. In the first phase, each study is evaluated separately. In the second phase, an assessment is made of the strength of the evidence for each of the three groups of evidence. For example, it may be concluded that there is ‘sufficient’, or ‘limited’, ... epidemiological evidence of carcinogenicity. Likewise, it may be concluded that there is ‘strong’, or ‘moderate’, or ‘weak’ mechanistic evidence of carcinogenicity. In the third phase, the evidence of the different groups is combined and the agent’s carcinogenicity is assessed, ranging from “Group 1: The agent is carcinogenic to humans” to “Group 4: The agent is probably not carcinogenic to humans”.

In the second part of the presentation I will show that these procedures and criteria are at odds with contemporary theories of causation in the following way: in the third phase, they systematically downplay the weight of mechanistic evidence. For example, if there is ‘sufficient’ epidemiological evidence of carcinogenicity, the agent is placed in group 1 (irrespective of any mechanistic evidence pro or contra carcinogenicity). Mechanistic evidence is only used to guide extrapolation from animal experiments to humans in case epidemiological evidence is less than ‘sufficient’.

However, mechanistic evidence can have at least two other important roles that are neglected in the IARC procedures. Firstly, it may help to solve the problem of confounders that threatens non-experimental studies. In the absence of mechanistic background knowledge, it can be argued, no ‘sufficient’ epidemiological evidence may be obtained (cf. [2] for a similar argument in the context of the social sciences). Secondly, it may help to assess the temporal stability of correlations and causal relations.

In the last part I explore the ways in which the IARC’s procedures and criteria can be defended against the above criticism by invoking some weak (as opposed to strong, [3]), epistemic (as opposed to normative, [4]) precautionary principle. The procedures will rather result in false positives than in false negatives – and so they should.

References :

- [1] IARC (2006), ‘Preamble to the IARC Monographs on the Evaluation of Carcinogenic Risks to Humans.’ [Http://monographs.iarc.fr](http://monographs.iarc.fr)
- [2] Steel, D. (2004), ‘Social Mechanisms and Causal Inference’, *Philosophy of the Social Sciences* 34:55-78.
- [3] Hughes, J. (2006), ‘How not to criticize the precautionary principle’, *Journal of Medicine and Philosophy* 31:447-464.
- [4] Peterson, M. (2007), ‘Should the precautionary principle guide our actions or our beliefs?’, *Journal of Medical Ethics* 33:5-10.

Agnieszka Rostalska (UGent/University of Gdansk) :
Modal Logic & Philosophy: a case study.
Swinburne's modal argument for the existence of souls
 (Joint work with Rafał Urbaniak)

Abstract :

Modal logic is often used (and sometimes misused) in philosophical arguments. An interesting case, where the language of quantified propositional modal logic is put to work, is Swinburne's argument for the existence of souls. It is interesting for two reasons:

(1) He argues for the existence of his soul from the assumption that it is logically possible that he survives the destruction of his body, and hence, he insists that a claim about logical possibility has important existential consequences.

(2) He fails at providing a compelling argument, but his argument isn't trivially flawed, so it is quite interesting to see what went wrong.

In these respects it is similar to Anselm's ontological argument which argues for a very strong conclusion from apparently simple premises and whose flaws nevertheless can't be easily pointed out.

Swinburne's original formulation, even though it employs formalism to a certain degree, does not provide us with a completely formalized argument whose all premises are explicitly stated. We start with giving a full formalization of Swinburne's argument. Next, we show that the argument is valid: its conclusion follows from the premises, given a very modest logic (it's not stronger than the quantified propositional version of **T**).

Fixing these details allows us to assess the plausibility of the main objection against Swinburne, put forward by Alston and Smythe (1994) and Zimmerman (1991) and the soundness of Swinburne's response to it (1996). Even though the objection does falsify one of the premises, there's a strategy that Swinburne may employ to evade this sort of criticism. We describe this strategy and show how it allows Swinburne to answer the objection.

Alas, the very same move that allows Swinburne to avoid the criticism makes his argument epistemically circular. We explain the notion of epistemic circularity at play and show how exactly Swinburne's modal argument falls into a dilemma that makes it either unsound or epistemically circular.

References :

Alston, W. P. And Smythe, T.W. (1994). Swinburne's argument for dualism. *Faith and Philosophy*, 11(1): 127-133

Swinburne, R. (1984). *Personal Identity*, chapters 1-4, The Dualist Theory, pp. 1-66, Basil Blackwell

Swinburne, R. (1986). *The Evolution of the Soul*. Clarendon Press.

Swinburne, R. (1996). Dualism intact. *Faith and Philosophy*, 13(1): 68-77

Zimmerman, D. W. (1991). Two Cartesian arguments for the simplicity of the soul. *American Philosophical Quarterly*, 3:217-226

Federica Russo (UCL) :
Variational Causal Claims in Epidemiology

Abstract :

According to the dominant paradigm, regularity and invariance are the key notions in causal reasoning. This paper examines the case of epidemiology and argues that epidemiological research aims at establishing variational causal claims rather than regular and invariant ones. This tenet is defended on the grounds that the goals and methods of epidemiology, together with the attempts to define causality in epidemiological research all point to variation as the rationale of causal reasoning.

Rafał Urbaniak (UGent) :
Capturing Dynamic Frames

Abstract :

Research in cognitive psychology (Rosch 1973, 1975a,b, 1978, 1983) led to the introduction of the notion of a dynamic conceptual frame as an alternative to the classical theory of concepts. The notion turned out to be useful in accounting for the way humans categorize objects (Barsalou 1987; Barsalou and Hale 1993; Barsalou 1993; Barsalou and Yeh 2006). Motivated by the work of Kuhn (esp. Kuhn 1974), certain applications to the history of science have been put forward and it has been argued that dynamic frames are a useful tool for accounting for scientific revolutions and conceptual frame incommensurability (Andersen et al. 2006). The cognitivists' treatment of dynamic frames is fairly informal and the logical aspects of the issue have not been investigated. The present work is intended as a step towards filling the gap between interesting but informal insights of cognitive researchers and the mainstream methodology of formal logicians.

A partial dynamic frame (developed for a single concept A only) is composed of two layers of concepts: attributes and values. Every object that falls under A is supposed to have all the attributes. Objects having a certain attribute are divided according to what values of those attributes they instantiate. Some combinations of values (from among each of the attributes one value is chosen) are considered to be activated. This, roughly speaking, means that objects that instantiate values from that combination are taken to constitute a separate taxonomical unit. (There are some further complications, that go beyond the scope of the present abstract.)

I first delimit the class of flat (there is no priority relation between the attributes), finite (both the set of attributes and the set of values are finite) and grounded (neither the superordinate concept is taken to be a unit generated by another frame nor the subordinate concepts are taken to generate their own frames) dynamic frames (there are independent reasons why this class is interesting). Having done that, I develop a first-order language which can be used to express such frames by a finite set of formulas. Then I introduce a convenient way of capturing a reasoning led within a conceptual framework. The basic idea is that it can be modeled by a certain adaptive logic when we keep the premises of a reasoning the same, but take abnormalities to be negations of formulas from the set that describes a frame.

References :

- Andersen, H., Barker, P., Chen, X. (2006). *The Cognitive Structure of Scientific Revolutions*. Camb. Univ. Press.
- Barsalou, L. (1987). *The instability of graded structure: Implications for the nature of concepts*. In Neisser, U., editor, *Concepts and conceptual development: Ecological and intellectual factors in categorization*, pp. 101-140.
- Barsalou, L. (1993). *Concepts and meaning*. In Barsalou, L., Yeh, W., Luka, B., Olseth, K., Mix, K., and Wu, L., eds, *Chicago Linguistic Society 29: Papers from the parasession on conceptual representations*, pp. 23-61.
- Barsalou, L. & Hale, C. (1993). *Components of conceptual representation. from feature lists to recursive frames*. In Van Mechelen, I., Hampton, J., Michalski, R., and Theuns, P., editors, *Categories and concepts: Theoretical views and inductive data analysis*, pp. 97-144. Academic Press.
- Barsalou, L. & Yeh, W. (2006). *The situated nature of concepts*. *American Journal of Psychology*, 119:349-384.
- Kuhn, T. (1974). *Second thoughts on paradigms*. In Suppe, F., ed., *The Structure of Scientific Theories*.
- Rosch, E. (1973). *Natural categories*. *Cognitive Psychology*, 4:328-350.
- (1975a). *Cognitive representations of semantic categories*. *J. Exper. Psych.: General*, 104:192-233.
- (1975b). *Family resemblances: Studies in the internal structure of categories*. *Cogn. Psych.*, 7:573-605.
- (1978). *Principles of categorization*. In Rosch, E. and Lloyd, B., eds, *Cognition and categorization*, pp. 27-48. Erlbaum.
- (1983). *Prototype classification and logical classification. the two systems*. In Scholnick, E., ed., *New Trends in Cognitive Representation*, pp. 73-86. Erlbaum.
- Wittgenstein, L. (1953). *Philosophical Investigations*. Blackwell.

Arne Vangheluwe (UCL) :
Miracles in an Essentialist Perspective

Abstract :

The presentation offered will try to give an overview of the guiding ideas and results in philosophy of science of an interdisciplinary PhD research project.

The articulation of science and theology is a continually evolving interaction in which philosophy has established itself as a necessary mediator if one wishes to avoid misunderstandings and one-sided approaches. In particular we wish to examine how one can make sense of specific and particular divine interventions, commonly denominated as “miracles”. In effect, a scientific worldview out of its own nature precludes supernatural and intentional causation. Therefore, how can a man of science have faith in a personal God which is present and active in his own life? From a theological point of view it has to be clarified what elements are of relevance to a supposed divine intervention, and what kind of action is in accordance with specific views on God’s character. On the other hand - this will be the object of this presentation - we must examine the status of this scientific worldview. This is where philosophy of science has to make its contribution.

A miracle is usually conceived of as a violation of the laws of nature, caused by a God in a religiously significant situation. This introduces immediately a strong opposition between divine action as an entirely supernatural intervention on one hand and natural causality on the other ; it is not immediately clear whether this is actually a fully justified opposition. What is more, a close analysis of most arguments against this concept of miracle quickly shows their circularity: often specific ontological or metaphysical statements that are taken for granted are smuggled in the argument, while actually containing the point one wants to prove. The same difficulty is encountered when we try to analyse concepts such as “determinism” or “law of nature“. If we want to clarify the links we may make with theology, we need to make explicit what typical properties a science-based worldview has. A global philosophy of science is indeed needed. We choose to work from the essentialist philosophy developed by Brian Ellis, an Australian philosopher of science. His starting point is the observation that science shows us a world rich in structure and order. Physical reality can be categorised in a hierarchical order of natural kinds of objects, the paradigmatic example being the Mendeleev table of chemical elements. Those natural kinds are defined by a number of essential properties; it is the scientist’s job to study and discover these essential properties. For Ellis, dispositional properties are an irreducible part of the essential properties of kinds: an electron has no choice but to repel other negative charges. A natural law is nothing more than the description of the processes that follow from the essential dispositional properties of the different kinds, causing certain natural kinds of processes.

The necessity of the laws of nature is therefore situated in the identities of the objects itself, in opposition to most discussions of miracles, where laws of nature and objects are seen as fully independent of one another. In the final part of the presentation it will be examined what are the consequences and possible problems of this type of philosophy of science for our question of divine intervention.

HISTORY OF SCIENCE

Paloma de la Vallee (UCL) :

When General Mechanics meet Scientia Navalis: Ship Stability

(Joint work with Patricia Radelet)

Abstract :

Introduction:

Due to economical and military importance of the Navy, the mechanic of ships was a subject of interest in the 17th and the 18th centuries, leading to several European states promoting research in this field by means of academic prizes. Interested in both the prizes and the complexity of the subject, numerous scientists of first quality did devote themselves to investigation in naval science.

This report studies works on floating body equilibrium and stability from Antiquity to present, showing how investigations in stability lead to better understanding of hydrostatics, and general mechanics.

Ship stability:

First traces of research on floating body stability lead back to Archimedes. He established the first hydrostatic theory, based on the hypothesis that fluids yield to what he calls pressure. The application of Archimedes' principle allowed him to determine the stable equilibrium of homogenous geometrical bodies.

Inspired by the work of Archimedes, Stevin and Huygens brought it further, although supported by new hydrostatic theories, based on the immersion of a vessel for Stevin, on a lowest position of the center of gravity for Huygens. Stevin tried to apply his knowledge of mechanics to stability of ships without success, probably due to his modelisation of forces with ropes. Huygens proved some theorems on the vertical distance between centers of gravity, which he used to find the equilibrium of new geometrical forms.

Later on, research took a new direction with the impulsion of de la Croix, who drew Euler onto the subject, and thanks to correspondence, Johann and Daniel Bernoulli. If the writings of de la Croix mainly underline the shortcomings of science understanding in lesser knowledgeable circles, they caused Euler to go back to the very first principles of mechanics to understand the faults of de la Croix. Later on, Euler and Daniel Bernoulli started to apply geometry and analysis to bodies of non-geometrical form, Euler bringing forward first positive results for ships. Interested in dynamics, Daniel Bernoulli and Euler tried to derive forces and proceeded to the description of oscillatory movement.

Simultaneously, Bouguer took a very geometrical approach, which allowed him not only to study the stability of ships close to equilibrium, measured in term of metacentric height, but also far from equilibrium. Bouguer defined the stability curves still used nowadays.

These results will be brought further in dynamics, Duhamel, Clebsch and Guyou underlining that the hydrostatic law cannot be applied to description of movement. However, if this conception is adapted for a true description of movement in a non-hydrostatical environment, it is hardly applicable architectural design, reason why the hydrostatical ship stability theory established by Euler and Bouguer is taught at present time.

Liesbeth De Mol (UGent) :

Man-computer interaction. An analysis of what it was, is and could be

Abstract :

How to « talk » with a computer? This fundamental question, determining as it does the ways one can and decides to use the computer, has had many different answers throughout the history of computing. Indeed, it is a long way from the « hands-on policy » of the ENIAC (there being no interface whatsoever) to the development of high-level programming languages and GUI's (Graphical User Interface) used by the average computer user to « control » his/her computer. Probably due to its omnipresence in current society, the topic of man-computer interaction is still very much alive today. It is studied in many different disciplines ranging from computer science (e.g. artificial intelligence) to the arts (e.g. media art), and is discussed both from theoretical as well as from more practical (engineering) points of view. Lately, Peter Wegner and Dana Goldin have even proposed man-computer interaction as a new paradigm of computability replacing and claimed to « go beyond » the Turing model. Because of its significance nowadays, it is important to study the historical roots of man-computer interaction, i.e., how it was discussed and implemented during the first years of the electronic, digital general-purpose computer. By doing so one can come to a better understanding of or even find new solutions to current (technical and philosophical) problems related to this topic. In this talk we will focus both on the practice of and the ideas on man-computer interaction during the first years of the electronic digital general-purpose computer (starting 1946 with the presentation of the ENIAC to the public). This historical analysis will show why and how the notion of interface - as the translator between man and computer - slowly emerged and how this development was (critically) evaluated by some computer pioneers (including D.H. Lehmer, A. Turing and K. Zuse). By way of conclusion we will confront our historical analysis with some existing theories and implementations of man-computer interaction. By doing so we want to show how the growing distance between man and computer not only implies, in certain cases, an increasing control over the computer and the user, but also gives rise to new possibilities.

Ronny Desmet (VUB) :
Minkowski's Influence on Whitehead

Abstract :

Alfred North Whitehead (1861-1947) is known by many for his *Principia Mathematica* collaboration with Bertrand Russell, and by some for his later philosophical adventures. In order to discover the influence of Hermann Minkowski on Whitehead, however, we must not primarily focus on the mathematics of his Cambridge period (1880-1910), nor on the metaphysics of his Harvard period (1924-1947), but on his involvement with relativity during the London period of his professional career (1910-1924). This involvement culminated in an alternative rendering of Einstein's general theory of relativity in his 1922 book, *The Principle of Relativity with applications to Physical Science*.

Whitehead's alternative theory of gravitation is a Minkowski background-dependent theory of gravitation, both in the technical sense of describing the gravitational field against a Minkowskian space-time background, and in the historical sense of being rooted in a Minkowskian context.

When Whitehead, in the aftermath of the famous British expedition testing Einstein's general theory of relativity in the context of the 1919 solar eclipse, was asked to write an article on "Einstein's theory" for *The Times Educational Supplement*, he included the following tribute to Minkowski: "Before passing on to Einstein's later work a tribute should be paid to the genius of Minkowski. It was he who stated in its full generality the conception of a four-dimensional world embracing space and time, in which the ultimate elements, or points, are the infinitesimal occurrences in the life of each particle. He built on Einstein's foundations and his work forms an essential factor in the evolution of relativistic theory." (February 12, 1920) The aim of this paper is to show that the latter sentence is not only true in general, but also holds for Whitehead in particular – Minkowski's work forms an essential factor in the development of Whitehead's relativistic theory.

In order to reach this aim, in a first movement, based on a number of biographical details and on Whitehead's scarce references, my paper identifies the most relevant Minkowskian sources of Whitehead's theory of gravitation. For example: Minkowski's 1908 Cologne lecture, "Space and Time"; E.B. Wilson and G.N. Lewis's 1912 memoir, "The Space-Time Manifold of Relativity"; Ebenezer Cunningham's 1914 book, *The Principle of Relativity*; Ludwik Silberstein's 1914 book, *The Theory of Relativity*; and Silberstein's 1918 article, "General Relativity without the Equivalence Hypothesis." In a second part, the paper will give a mathematical reconstruction of Whitehead's theory of gravity based on elements drawn from the Minkowskian sources identified in the first part, but also on elements drawn from Einstein's general theory of relativity. As Whitehead wrote in conclusion of Part I of *The Principle of Relativity*: "My whole course of thought presupposes the magnificent stroke of genius by which Einstein and Minkowski assimilated time and space. It also presupposes the general method of seeking tensor or invariant relations as general expressionist for the laws of the physical field, a method due to Einstein. But the worst homage we can pay to genius is to accept uncritically formulations of truths which we owe to it."

Astrid Elbers (UGent) :
Experiments in Descartes' Les Météores

Abstract :

We will focus on the role of experiments in the work of Descartes, more specific in his *Météores*, which was one of the three essays included by the *Discours de la Méthode* (1637). First there is the question how Descartes could both be a rationalist, who sees knowledge as deriving from the intellect, and an experimentalist, who sees experiment and observation as essential to the enterprise of knowledge. How is the appeal to experience consistent with the apparently deductive structure of Descartes' project? In the past, there has been a considerable literature on this basic question. The answers range from denying or ignoring the interest in experiment, to denying that Descartes' science was ever intended to be deductive, to claiming that Descartes was simply inconsistent. But we think we can conclude, focussing on his *Météores*, that Descartes is not inconsistent at all, although his terminology is sometimes ambiguous. Experiment is an indispensable tool for discovery in his deductive science and it is to experience that we must turn to help us sort out the details of the deductive hierarchy of knowledge. This is especially clear in his discourse on the rainbow in the *Météores*. This discourse is the only place in which he refers explicitly to his method by saying that he will show how his method brings us to knowledge, that his predecessors didn't possess. We will see how Descartes' experiments function here at what Daniel Garber calls the *reductive* stage of his method. But we will also show that in the other discourses in the *Météores*, experiments fulfil different, though not inconsistent functions.

There is of course much more to say about Descartes' experiments than determining their function in his line of thought. Descartes' experiments shed a light on the so called art-nature debate. Many authors have argued that pre-modern science was anti-experimental and 'noninterventionist'. They argued that for Aristotle and his followers, intervention in nature for the purpose of experimentation would yield a badly compromised, artifactual sort of knowledge rather than proper knowledge of nature. That this view is not correct, was recently shown by William Newman. He shows that medieval alchemists argued that natural products could be replicated by man, as long as one knew their causes and could duplicate them. Already in the Middle Ages, a link was made between alchemy and the rainbow, with respect to the art-nature distinction. Themo Judaei remarked in the 14th century in his *Quaestiones*: "Concerning the things that are generated underground, it is sought whether metals can be made with the aid of art, just as the rainbow and the halo sometimes are artificially made." As we will see, art and nature really 'conflate' in the work of Descartes. There is no difference between artificial and natural bodies other than the size of their parts, as he says in his *Principles*. Doing experiments leads to knowledge about the real causes of natural phenomena. Descartes concludes his *Météores* by saying that "I hope that everybody who has understood what is said in this treaty, will in the future not see anything in the clouds of which he cannot easily understand the causes, or which gives him a reason for admiration."

This brings us to the last point, namely that the art-nature discussion is at its turn interwoven with the concept of 'wonder'. For Renaissance engineers, a distinction pertained between rainbows of the sky and those produced in fountains. Fountain rainbows were considered the joint product of art and nature – nature cultivated or assisted by the engineer's art to produce effects and wonders. As we will see, Descartes presented a 'science of wonders' destined not to eradicate wonder but to make transparent the wonders of traditional garden engineers and replace them with wonders derived from knowledge of mathematical and mechanical philosophy.

Sandra Mols (FUNDP) :

Disseminating Electronics: Bell Telephone and the Emergence of Electronic Computing Research in Belgium
(Joint work with Marie d'Udekem-Gevers)

Abstract :

By Anglo-Saxon standards, post-World War II Belgian R&D was affected by severe delays due to the destructions and isolation generated by the conflict. This situation was no exclusivity of Belgium. A similar state of affairs pervaded most of Western Europe. The motto that then spread out in Europe was that action had to be taken to catch up with Anglo-Saxon development. Freshly emerging out of World War II-related efforts in R&D, electronic computing was one such field about which delays and backwardness were identified in Belgium.

Interest for electronics pervaded postwar Belgian military, governmental and academic circles, following on emergence of awareness of the importance of sophisticated computing tools for modern warfare, management and research in the physical sciences. Soon missions were organised towards the US by the Fonds National de la Recherche Scientifique to collect information on the advancement of Anglo-Saxon science and technology. One such mission, in the hands of Manneback, a renown physicist from Louvain, delivered the news of the emergence of the electronic computer in the US and UK. In the meantime, electronics research, research in 'électricité des courants faibles', was also emerging due to teaching and research taking place in polytechnic faculties and hautes écoles, at the Université de Liège for instance. Also assisting was the resuming of industrial activities in the sector, for instance at the Manufacture Belge des Lampes Electriques, a Belgian subsidiary of Philips based in Brussels.

A significant company as regards to industrial electronics research was Bell Telephone Manufacturing Company (BTM), a subsidiary of the American International Telephone & Telegraph (ITT) created in Antwerp in 1882. From the 1930s onwards, BTM had developed as a significant production site for switches in Europe, claiming profitable contracts with postal and telephone services in Belgium and other European countries, and serving as a training ground for ITT's employees and researchers in Europe. As soon as the war ended, BTM resumed its switching research. This led to the dissemination of electronics research in Belgian academia and industries. This dissemination of electronic computing research in Belgium is explored in this paper by the examination of the work and research legacies generated by the research laboratory developed by BTM for providing Belgium with a prestigious modern electronic digital computer, the laboratory set up for the construction of the so-called Machine IRSIA-FNRS. This laboratory later produced two other electronic calculators for the banking industry.

A central character to this story is Vitold Belevitch, a young, highly active and prolific engineer, specialist of circuit theory and head of BTM's Transmission Division, who was also part-time lecturer at the Université de Louvain and in various hautes écoles. Our paper shows how Belevitch's professional and personal networking in industrial, political, academic and administrative circles led to the emergence of a skilled generation of young researchers in electronics that disseminated electronic computing research, and skilled expertise in Belgian academia and industry.

Sébastien Moureau (UCL) :

The De anima in arte alchemiae of Pseudo-Avicenna

Abstract :

In 1572, Mino Celsi published in Basel in the publishing house of Pietro Perna a selection of medieval alchemical texts under the title of *Artis chemicæ principes, Avicenna atque Geber*. Among the various treatises in this compendium, we find the first (and only) edition of the *De anima in arte alchemiae*. This text was wrongly attributed to Avicenna at this time, and was probably written in Arabic in the 12th century in Spain, and then translated into Latin about 1235 (the original Arabic text has not been identified yet). This work is divided into two parts: a theoretical part, named *Porta elementorum*, exposing a theory of matter, and a more practical part, with many alchemical recipes. The *De anima in arte alchemiae* is one of the most representative texts of the alchemy founded on organic substances, which will provide to this treatise a great success until the 14th century.

Jurgen Naets (KUL) :

How to define a number?

A general epistemological account of Simon Stevins (1548-1620) art of defining

Abstract :

Several shifts of content, or at least, of emphasis can be distinguished when one studies how a number was defined in sixteenth century mathematics. In Simon Stevins *L'arithmétique* of 1585, we find a relatively informal but new understanding of the concept of number. Rather than focussing primarily on the strict mathematical and technical issues concerning this new notion of number, I will concentrate on the philosophical background, which was clearly hinted at in some epistemological statements and argumentative practices in his oeuvre. The epistemological principles in his mathematics are, so I will argue, consistent with his overall treatment of language, representation and signification. I will show that much of Stevin's epistemological stance rests on his linguistic conception of mental processes, in which he centers on the 'propositional' nature of signification, and that this was a result of his strong emphasis on relationships as the key to understanding and knowing.

Sylvie Neven (ULg) :

The Strasbourg Family Text : mediaeval artists' recipes books as sources for historical study of art technology

Abstract :

For a long time, the Strasbourg Manuscript has been seen as one of the oldest German-language source for the study of North European painting techniques. Its content is mostly dedicated to instructions for the preparation of pigments, mediums, glues and gilding grounds. Lost in the 1870 Strasbourg Library fire, the text survives in a 19th century transcription made by Sir Charles Eastlake (director of the National Gallery of London from 1855 until his death in 1865). Since the two main editions published by Berger in 1897 and Borradaile in 1966, several manuscripts have been highlighted for containing texts with very similar contents. Doris Oltrogge grouped them under the name of the 'Strasbourg Family'. However, a complete list of the Family texts has not previously been established and the relationship between them requires further attention. By studying texts coming from the German speaking countries in the late Middle-Ages (more or less 150 manuscripts), I have established a corpus of manuscripts belonging to this family.

Thanks to a philological and codicological analysis, we can propose a geographical area in which these manuscripts were produced as well as a chronological range from 1400 to 1560. Research concerning their provenance and history provide us with information about their nature and their use.

The possibility of collating different manuscripts of the same textual tradition offers us a broad view of this specific artistic literature in a precise area. By comparing every manuscript and cross-checking their similar recipes we can learn more about the redaction and the compilation of technical painting books in the Middle Ages. We can also study the evolution of the same traditional text through time and through the different stages of copy, each characterized by variations in their content. Moreover, the nature of certain variations or errors across the text can often inform us about the author and the context of redaction.

A better knowledge of the nature and characteristics of mediaeval artists' recipes books will allow us to estimate their relevance as sources for the study of the history of artists' techniques.

Sofie Onghena (KUL) :

De wetenschapper als publieke weldoener Beeldvorming van Belgische Provinciale Instituten voor Bacteriologie (ca. 1900-1940)

Abstract :

In de voorgestelde paper zal de beeldvorming van de provinciale bacteriologische instituten voor de periode ca. 1900-1940 worden onderzocht. Rond de eeuwwisseling werden deze instituten in eigen land opgericht in navolging van het succesvolle onderzoek van Louis Pasteur en Robert Koch. Het eerste provinciaal bacteriologisch laboratorium werd in 1894 in Luik opgericht, in 1897 volgde Henegouwen en daarna Antwerpen, Brussel en Namen. Een uitvoerige instellingsgeschiedenis wordt evenwel vermeden. De klemtoon ligt op de mise-en-scène van genoemde instituten: de zelfrepresentatie en de perceptie van genoemde instellingen worden geanalyseerd aan de hand van brochures, administratieve verslagen en krantenartikels.

Zelfrepresentatie was echter ook nauw verbonden met een personencultus. In deze instituten vielen herdenkingen immers veelal samen met vieringen ter ere van de directeur. In het tweede luik van de verhandeling wordt daarom de beeldvorming van de eerste directeurs van deze instituten onderzocht, onder wie Martin Herman (directeur van het *Institut Provincial d'Hygiène et de Bactériologie du Hainaut*, 1898-1930), Nobelprijswinnaar Jules Bordet (directeur van het *Institut Pasteur du Brabant*, 1901-1940) en Achille Haibe (directeur van het Naamse *Institut Bactériologique Provincial*, 1903-1939). Allen waren opgeleid in academische laboratoria. Soms kregen ze ook een academische aanstelling. Hun netwerken waren niettemin ruimer dan louter de universitaire wereld: vooral de provinciale en lokale geneeskundige commissies speelden een belangrijke rol. Wellicht was dit een bepalende factor voor de beeldvorming van de directeurs. Ze werden doorgaans voorgesteld als publieke weldoeners wier praktische verwezenlijkingen -zoals het indijken van epidemieën, de ontsmetting van woningen, de strijd voor drinkbaar water- en hun inzet voor de mensheid werden beklemtoond.

Hoewel hen evenzeer hulde werd gebracht met schilderijen, busten of plaquettes, leek de beeldvorming van deze directeurs toch enigszins te verschillen van de beeldvorming van wetenschappers aan het hoofd van academische bacteriologische laboratoria in de betrokken periode. Ten slotte wordt onderzocht welke andere nuances er in academische biografieën, necrologieën, lofredes en krantenartikels werden gelegd. Primeerden bij wetenschappers verbonden aan universitaire laboratoria eerder kennisverwerving en opleiding van leerlingen? Waren zij ook publieke weldoeners? Of zorgde de historiografie voor een ander beeld?

Eva Pieters (UGent) :

"Clear moon, frost soon": A comparative study of meteorological practices in the Low Countries (1550-1850)

Abstract :

The weather has always been a subject of interest to a broad range of people throughout history. Physicians, mathematicians, astrologers, philosophers, botanists,... were –for various reasons- fascinated and inspired by meteorological events.

For the common man, weather circumstances were of substantial importance in everyday life. The economical and agricultural significance of weather events is obvious, but the meaning of meteorological practices on a social, cultural and religious level has mostly been ignored by historians.

Rain, wind, snow or frost are not only natural phenomena, but also operate as a subject of conversation: the weather is a shared experience through which social language practices enable a form of talking about the world. The history of meteorology in this sense can, as Vladimir Jankovic demonstrated in *"Reading the skies, a cultural history of English Weather 1650-1820"* (Manchester, 2000), provide a useful source for the history of the socio-cultural implantation and reception of knowledge-production within societies.

The history of meteorology and especially the relationship between meteorological events and the way people interpret those events and interact with them is still a blank page in the history of the Low Countries.

This paper will explore the possibilities and boundaries of a research project that aims at writing a socio-cultural meteorological history of the Low Countries. It will focus on Antoine Mizaulds *'Le Miroir du temps'* as a particular example of the social, religious and cultural interweavensness of meteorological practices, and the close connection of meteorology with astrology, mathematics, medicine and biology.

Raffaella Toncelli (ULB) :
Geometry and the Theory of Relativity

Abstract :

Special Relativity (SR) and the theory of General Relativity (GR) establish an important link between geometry and physics and lead us to question on the relation between these two disciplines. In this talk I will pay attention to some remarks of Henri Poincaré upon geometry and physics and in particular upon homogeneity of space and the relativity principle. I will show how Poincaré formulated some different versions of relativity principle between 1899 and 1906 and in particular I will analyse the statement of the principle he published in his article *Sur la dynamique de l'électron* (1906). In the second part of this talk I will investigate the Einstein's approach to the SR and GR and I will show that in Einstein's epistemology the link between physics and geometry plays a very different role.