

Is there such a thing as philosophical logic?

Thomas Müller

Thomas.Mueller@phil.uu.nl
Department of Philosophy
Utrecht University

Guangzhou, 12 November 2012
Cultures of Mathematics and Logic

Yes or no?

Which contrast?

The case of
determinism

Lukasiewicz
Prior
Thomason

What is
philosophical
logic?



Universiteit Utrecht

Logic today is a multidisciplinary endeavor, spanning a.o.

- ▶ computer science
- ▶ linguistics
- ▶ mathematics
- ▶ philosophy

Logic and philosophy: evolving interrelation

- ▶ Logic used to be a branch of philosophy (like so much else)
- ▶ Philosophical questions were a key driving force, e.g.
 - for ancient and medieval logic
 - for formal logic in the 20th century
- ▶ What is the relation between logic and philosophy now?
- ▶ Specifically: Is there such a thing as philosophical logic?
- ▶ Several fields of interaction, e.g., determinism

Yes or no?

Which contrast?

The case of
determinism

Lukasiewicz
Prior
Thomason

What is
philosophical
logic?



Overview

Yes or no?

Which contrast?

The case of determinism

Łukasiewicz

Prior

Thomason

What is philosophical logic?

Yes or no?

Which contrast?

The case of
determinism

Łukasiewicz

Prior

Thomason

What is
philosophical
logic?



NO

It's not in the *Dictionary of philosophical terms*

philosophical faith • philosophischer Glaube(n)
m (Jaspers) (met)

philosophical grammar • philosophische
Grammatik *f (Wittgenstein) (lan)*

philosophical idealism • philosophischer
Idealismus *m (epi, met)*

philosophical realism • philosophischer
Realismus *m (epi, met)*

philosophical speculation • philosophische
Spekulation *f (gcp)*

philosophical suicide • philosophischer
Selbstmord *m (Camus) (met)*

philosophical theology • philosophische
Theologie *f, philosophische Gotteslehre f*
(rel)

philosophical theorem° • Philosophem *n (gcp)*
→ philosopheme

philosophical wonder • philosophisches
Staunen *n (gcp)*

philosophical world-orientation • philo-
sophische Weltorientierung *f (Jaspers) (met)*
< world orientation

Logik, mathematische f • mathematical logic
(log, mat) → Logik, symbolische

Logik, mehrwertige f • many valued/order
logic *(log)*

Logik, monotone f • monotonic/monotone logic
(log)

Logik, nichtklassische f • non-classical logic
(log) < Logik, nichtmonotone

Logik, nichtmonotone f • non-monotonic logic
(log)

Logik, nominalistische f • nominalist logic *(log)*

Logik, parakonsistente f • paraconsistent logic
(Vasilev etc) (log)

Logik, produktive f • productive logic
(Jaspers) (met)

Logik, prozedurale f • procedural logic *(log)*
→ Prozeßlogik

Logik, prozessuale f • logic of processes *(log)*

Logik, symbolische f • symbolic logic *(log)* →
Logik, mathematische

Logik, temporale f • temporal/tense logic *(log)*
→ Zeitlogik

Logik, traditionelle f • traditional logic
(Aristotle etc) (log)

Logik, transzendente f • transcendental logic
(Kant) (epi, log) < W 311

Logik, unscharfe f • vague/fuzzy logic *(log)*
< Logik, nichtmonotone

Logik von Port Royal f • Port Royal Logic
(log)

Logik, zweiwertige f • two-valued/bivalent
logic *(log)* → Logik erster Ordnung

Yes or no?

Which contrast?

The case of
determinism

Lukasiewicz
Prior
Thomason

What is
philosophical
logic?

Nor in most other reference works (e.g., SEP)



Universiteit Utrecht

YES

There's a successful *Journal of philosophical logic*

There's a successful *Handbook of philosophical logic*

cover image

cover image

And there's more

Yes or no?

Which contrast?

The case of
determinism

Lukasiewicz

Prior

Thomason

What is
philosophical
logic?



Universiteit Utrecht

From the *Handbook of philosophical logic*

“The *Handbook of Philosophical Logic* is a unique systematic survey of the central areas of philosophical logic. [...] Written by world authorities in philosophical logic [...]”

“[T]he field of philosophical logic [is] vast and heterogeneous with roots in general philosophy, mathematical logic and theoretical linguistics to cite just a few [...]”

Distinguishes “work done under the term philosophical logic”, which also includes work from “related disciplines like the philosophy of science or the philosophy of mathematics”, from philosophical logic proper

Important canonizing function (2nd edition is much larger)

But no definition of the field

Yes or no?

Which contrast?

The case of
determinism

Lukasiewicz
Prior
Thomason

What is
philosophical
logic?



From the *Journal of philosophical logic*

Aims and scope says:

The *Journal of Philosophical Logic* aims to provide a forum for work at the crossroads of philosophy and logic, old and new, with contributions ranging from conceptual to technical.

Accordingly, the *Journal* invites papers in all of the traditional areas of philosophical logic, including but not limited to: various versions of modal, temporal, epistemic, and deontic logic; constructive logics; relevance and other sub-classical logics; many-valued logics; logics of conditionals; quantum logic; decision theory, inductive logic, logics of belief change, and formal epistemology; defeasible and nonmonotonic logics; formal philosophy of language; vagueness; and theories of truth and validity.

In addition to publishing papers on philosophical logic in this familiar sense of the term, the *Journal* also invites papers on extensions of logic to new areas of application [...]



Yes or no?

Which contrast?

The case of
determinism

Lukasiewicz
Prior
Thomason

What is
philosophical
logic?

“Philosophical logic”: history (I)

Historisches Wörterbuch der Philosophie has an entry on philosophical logic in the modern era

Logik, philosophische, in der Neuzeit (erkenntnistheoretisch, psychologisch und ontologisch orientierte). In der Neuzeit tritt das Interesse am logischen Formalismus vorerst zunehmend zurück, die logische Arbeit verlagert sich auf philosophische Fragen erkenntnistheoretischer, psychologischer oder auch ontologischer Art. So entstehen ‘L.en’, vielfach von erheblichem Rang, die in einer vom durch die formale L. im Sinne von Leibniz, Kant und Frege gekennzeichneten Standpunkt geschriebenen L.-Geschichte in den Hintergrund rücken. Dem wird hier

Yes or no?

Which contrast?

The case of
determinism

Lukasiewicz
Prior
Thomason

What is
philosophical
logic?



“Philosophical logic”: history (II)

“Philosophical logic” of 16th cent. ff. criticized as “without insight for deep problems, psychologistic” (Bocheński)

Focus on semiotics, concepts

Kant: Focus on judgment

- ▶ Formal logic, as studying only the pure form of thought — for Kant, completed with Aristotle
- ▶ Formal issues: identity, non-contradiction
- ▶ Transcendental logic. Table of categories, necessary kinds of content

“Laws of thought”, but aim to be non-psychological

Not our notion of philosophical logic

Yes or no?

Which contrast?

The case of
determinism

Lukasiewicz
Prior
Thomason

What is
philosophical
logic?



Which contrast?

If there *is* “philosophical logic”, is it philosophical rather than:

- ▶ symbolic? (as in *Journal of symbolic logic*)
- ▶ formal? (as in *Notre Dame journal of formal logic*)
- ▶ applied? (as in *Journal of applied logic*)
- ▶ mathematical? (as in *Journal of mathematical logic*)
- ▶ ...?

Many clear non-candidates for the relevant contrast, e.g.:
ancient, deontic, epistemic, intuitionistic, modal, paraconsistent,
Polish, provability, quantum, relevance, spatial, ...

Yes or no?

Which contrast?

The case of
determinism

Lukasiewicz
Prior
Thomason

What is
philosophical
logic?



Philosophical rather than mathematical

“Mathematical logic” nowadays seems clear enough:

- ▶ Logic as practiced by mathematicians
- ▶ Canonical subfields: set theory, model theory, recursion theory, . . .
- ▶ Research on “structural” questions, or triggered by questions in mathematics
- ▶ Channels back to mainstream mathematics (at least to some extent)
- ▶ Technically hard

Contrast philosophical logic:

- ▶ Logic as practiced by philosophers?
- ▶ No link back to mathematics? (Nowadays?)
- ▶ Often technically simple

Yes or no?

Which contrast?

The case of
determinism

Lukasiewicz
Prior
Thomason

What is
philosophical
logic?



Philosophical rather than formal

Could it be logic if it's not formal?

After all, logic is a formal science if there is one

There are courses in “informal logic”, or argumentation theory

If logic is about “telling good arguments from bad”, then such informal logic is logic

But

- ▶ a large part of philosophical logic *is* formal;
- ▶ it's not clear that informal logic belongs to philosophy, rather than, e.g., psychology or rhetoric

Still, there's a tradition of logics for specific content (not-just-formal logic?)

Yes or no?

Which contrast?

The case of determinism

Lukasiewicz

Prior

Thomason

What is philosophical logic?



Philosophical formal logic

Most of philosophical logic is formal—but “not just formal”?

Belnap, *Notes on the science of logic*:

Philosophical logician is interested in what the formalism e.g., of a three-valued logic, *means*.

Is there “content to the form”?

Or is form enforced by (philosophical) content?

Yes or no?

Which contrast?

The case of
determinism

Lukasiewicz
Prior
Thomason

What is
philosophical
logic?



(In)determinism in philosophy

Rough idea: Determinism claims that there is just one possibility for the future; indeterminism: more possibilities

Loose associations for “determinism” / “deterministic”:

- + precision, dependability
- + total control
- ironclad necessity, preordained
- making us helpless
- exclusion of control through us

Yes or no?

Which contrast?

The case of determinism

Lukasiewicz
Prior
Thomason

What is philosophical logic?



(In)determinism and (philosophical) logic

Philosophical problems of determinism have led to many developments in (philosophical?) logic

Example here:

Future contingents: claims about the open future

Three episodes from the 20th century:

- ▶ Łukasiewicz, three-valued logic
- ▶ Prior, temporal logic
- ▶ Thomason, supervaluations

Yes or no?

Which contrast?

**The case of
determinism**

Łukasiewicz

Prior

Thomason

What is
philosophical
logic?



Determinism and three-valued logic

Jan Łukasiewicz

- ▶ “On the notion of possibility” (1920):
Motivating a 3rd truth value via possibility
- ▶ “On three-valued logic” (1920):
Tables for 3-valued connectives
- ▶ “On determinism” (rectoral address Warsaw, 1922):
Use of 3-valued logic for future possibility

pic

Yes or no?

Which contrast?

The case of
determinism

Łukasiewicz
Prior
Thomason

What is
philosophical
logic?



Universiteit Utrecht

Łukasiewicz: three-valued logic

On determinism (1922)

- ▶ Determinism: “If A is b at instant t it is true at any instant earlier than t that A is b at instant t ”
- ▶ Reference to Aristotle’s *De interpretatione*
- ▶ “To me, personally, the principle of bivalence does not appear to be self-evident. [. . .] Indeterminate sentences, which ontologically have possibility as their correlate, take the third truth value.”
- ▶ “The logical argument which seems to support determinism falls decisively.”

Yes or no?

Which contrast?

The case of
determinism

Łukasiewicz
Prior
Thomason

What is
philosophical
logic?



Universiteit Utrecht

Arthur Prior

- ▶ Studied ancient and medieval texts
- ▶ John Lock Lectures, Oxford 1955/56: *Time and Modality*
- ▶ From Diodorean modality to branching time: Invention of formal temporal logic
- ▶ *Past, Present and Future* (1967)

pic

Yes or no?

Which contrast?

The case of
determinism

Lukasiewicz

Prior

Thomason

What is
philosophical
logic?



Prior: tense (temporal) logic and branching time

- ▶ Tense logic: “it will be the case that” (F) and “it was the case that” (P) as sentence-modifying operators
- ▶ Atomic propositions: present-tensed
- ▶ “The truth-functional technique seems simply out of place”
- ▶ Suggestion Kripke: possibility via tree-like structures
- ▶ History: maximal chain in tree
- ▶ Main difficulty: Give semantics for future tense F
 - Standard relational, $m \models F\phi$ iff ex. $m' > m$, $m' \models \phi$
 - Peircean, $m \models F\phi$ iff in every history h through m ex. $m' > m$, $m' \in h$, s.t. $m' \models \phi$
 - Ockhamist, $m/h \models F\phi$ iff ex. $m' > m$, $m' \in h$, s.t. $m' \models \phi$

Yes or no?

Which contrast?

The case of
determinism

Lukasiewicz

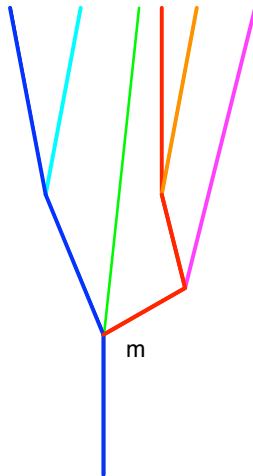
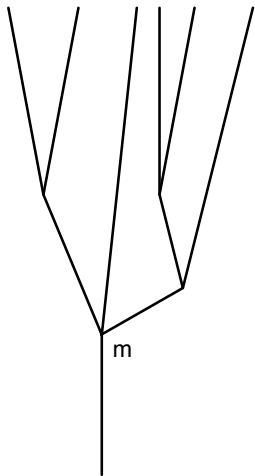
Prior

Thomason

What is
philosophical
logic?



Branching time: moments and histories



Yes or no?

Which contrast?

The case of
determinism

Lukasiewicz

Prior

Thomason

What is
philosophical
logic?



Prior: tense (temporal) logic and branching time

- ▶ Tense logic: “it will be the case that” (F) and “it was the case that” (P) as sentence-modifying operators
- ▶ Atomic propositions: present-tensed
- ▶ Suggestion Kripke: possibility via tree-like structures
- ▶ History: maximal chain in tree
- ▶ Main difficulty: Give semantics for F
 - Standard relational, $m \models F\phi$ iff ex. $m' > m$, $m' \models \phi$
Too many true
 - Peircean, $m \models F\phi$ iff in every history h through m ex. $m' > m$, $m' \in h$, s.t. $m' \models \phi$
Too many false
 - Ockhamist, $m/h \models F\phi$ iff ex. $m' > m$, $m' \in h$, s.t. $m' \models \phi$
Good (linear) behavior; settledness modality \square
But status of extra parameter h ?

Yes or no?

Which contrast?

The case of
determinism

Lukasiewicz

Prior

Thomason

What is
philosophical
logic?



Rich Thomason

- ▶ “Indeterminist time and truth-value gaps” (1970):
Formally precise discussion of Prior’s branching-time systems
- ▶ Parameters of truth: moments and histories
- ▶ Supervaluation technique applied to combine linear time and branching

pic

Yes or no?

Which contrast?

The case of
determinism

Lukasiewicz
Prior
Thomason

What is
philosophical
logic?



Thomason: supervaluations for future contingents

Start with Ockhamist semantics for branching time:

- ▶ $m/h \models F\phi$ iff ex. $m' > m$, $m' \in h$, s.t. $m' \models \phi$
Good (linear) behavior, but extra parameter h

In branching time, a context of utterance supplies the moment of utterance m_u , but not “the history of the utterance” – there are many.

Introduce supervaluationist postsemantics:

- ▶ ϕ is (super)true at m iff for all h through m , $m/h \models \phi$
- ▶ ϕ is (super>false at m iff for all h through m , $m/h \not\models \phi$
- ▶ Otherwise, no supervalue at m

Preserve some nice features; e.g., $F\phi \vee F\neg\phi$ is supertrue

Development continues

Yes or no?

Which contrast?

The case of
determinism

Lukasiewicz
Prior
Thomason

What is
philosophical
logic?



What is philosophical logic?

Determinism case-study suggests:

- ▶ Philosophical logic is triggered by philosophical issues
- ▶ Aims to find formal representations, thereby
 - improves understanding of the philosophical problems
 - removes ambiguities
 - improves clarity
- ▶ Philosophical logic has triggered formal developments

Of course, many other topics for philosophical logic.
Similar picture

Yes or no?

Which contrast?

The case of
determinism

Lukasiewicz
Prior
Thomason

What is
philosophical
logic?



Philosophical logic as formal conceptual modeling

Philosophical logic is best viewed as a modeling endeavor:

- ▶ Start with some specific content
- ▶ Find a formal means of expression
- ▶ The models used are distinctly logical:
 - regimented / formal languages
 - possibility of proving something
- ▶ Check back with content; possibly improve model
 - within the same framework
 - by extending the framework / developing new tools
⇒ creative formal side of philosophical logic

Yes or no?

Which contrast?

The case of
determinism

Lukasiewicz
Prior
Thomason

What is
philosophical
logic?

Philosophical logic is formal conceptual modeling



Universiteit Utrecht

Thanks for your attention!

Yes or no?

Which contrast?

The case of
determinism

Lukasiewicz
Prior
Thomason

What is
philosophical
logic?

