

How To Argue for Inferentialist Deflationism

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Horsten's Argument

Horsten's Premises

Why Deflationism Should be
Based Upon PKF

A Tension In Horsten's
Argument

Objection

How To Prove Unrestricted
Generalities

Field's Theory Outruns PKF

Discussion

Horsten Rejects Field's Theory

A Better Response on
Horsten's Behalf

What's So Bad About
Meta-Theory?

The Supposed Semantic
Self-Sufficiency of Ordinary
Discourse

Proposal

References

Introduction

- ▶ How do we formulate deflationism about truth?
- ▶ Horsten has set out to exploit the resources of *inferentialism*.
- ▶ *Inferentialist deflationism*: The meaning of the truth predicate is exhausted by inference rules.
- ▶ Horsten derives his inferentialist deflationism from a specific reading of formal truth theory.
- ▶ I argue that this approach fails.

Inferentialist

Deflationism

Jönne Speck

Horsten's Argument

Horsten's Premises

Why Deflationism Should be
Based Upon PKF

A Tension In Horsten's
Argument

Objection

How To Prove Unrestricted
Generalities

Field's Theory Outruns PKF

Discussion

Horsten Rejects Field's Theory

A Better Response on
Horsten's Behalf

What's So Bad About
Meta-Theory?

The Supposed Semantic
Self-Sufficiency of Ordinary
Discourse

Proposal

References

Outline

Horsten's Argument

Horsten's Premises

Why Deflationism Should be Based Upon PKF

A Tension In Horsten's Argument

Objection

How To Prove Unrestricted Generalities

Field's Theory Outruns PKF

Discussion

Horsten Rejects Field's Theory

A Better Response on Horsten's Behalf

What's So Bad About Meta-Theory?

Proposal

Inferentialist

Deflationism

Jönne Speck

Horsten's Argument

Horsten's Premises

Why Deflationism Should be
Based Upon PKF

A Tension In Horsten's
Argument

Objection

How To Prove Unrestricted
Generalities

Field's Theory Outruns PKF

Discussion

Horsten Rejects Field's Theory

A Better Response on
Horsten's Behalf

What's So Bad About
Meta-Theory?

The Supposed Semantic
Self-Sufficiency of Ordinary
Discourse

Proposal

References

Outline

Horsten's Argument

Objection

Discussion

Proposal

Inferentialist

Deflationism

Jönne Speck

Horsten's Argument

Horsten's Premises

Why Deflationism Should be
Based Upon PKF

A Tension In Horsten's
Argument

Objection

How To Prove Unrestricted
Generalities

Field's Theory Outruns PKF

Discussion

Horsten Rejects Field's Theory

A Better Response on
Horsten's Behalf

What's So Bad About
Meta-Theory?

The Supposed Semantic
Self-Sufficiency of Ordinary
Discourse

Proposal

References

How I Understand Horsten's Argument

- P1 Deflationists need to explain the meaning of the truth predicate by that formal theory that currently proves the most principles of truth.
- P2 The theory that currently proves the most principles is PKF.
- P3 PKF does not prove universal quantifications into the truth predicate over all sentences of the extended language but is closed under *inference rules* for the whole language.

Horsten's Argument

Horsten's Premises

Why Deflationism Should be Based Upon PKF

A Tension In Horsten's Argument

Objection

How To Prove Unrestricted Generalities

Field's Theory Outruns PKF

Discussion

Horsten Rejects Field's Theory

A Better Response on Horsten's Behalf

What's So Bad About Meta-Theory?

The Supposed Semantic Self-Sufficiency of Ordinary Discourse

Proposal

References

Horsten's First Premise: Deflationism and the Strength of Formal Theories

- ▶ Deflationism is about ordinary truth talk.
- ▶ The natural language truth predicate commutes with the logical connectives and quantifiers.

$$\forall x \forall y (Sent_a(x) \wedge Sent_a(y) \rightarrow (Tx \vee y \leftrightarrow Tx \vee Ty))$$

- ▶ I follow Horsten in that theories that prove merely all instances of the schema do not accommodate the *compositional intuition*.

$$T^{\ulcorner \phi \urcorner} \vee ^{\ulcorner \psi \urcorner} \leftrightarrow T^{\ulcorner \phi \urcorner} \vee T^{\ulcorner \psi \urcorner}$$

Horsten's Argument

Horsten's Premises

Why Deflationism Should be
Based Upon PKF

A Tension In Horsten's
Argument

Objection

How To Prove Unrestricted
Generalities

Field's Theory Outruns PKF

Discussion

Horsten Rejects Field's Theory

A Better Response on
Horsten's Behalf

What's So Bad About
Meta-Theory?

The Supposed Semantic
Self-Sufficiency of Ordinary
Discourse

Proposal

References

The Failure of the Disquotational Theory of Truth

Inferentialist
Deflationism
Jönne Speck

- ▶ The disquotational theory ('DT'): $T^{\ulcorner \phi \urcorner} \leftrightarrow \phi$ for any \mathcal{L}_a -sentence ϕ .
- ▶ DT does not prove the universally quantified principles of compositionality.

$$\forall x \forall y (Sent_a(x) \wedge Sent_a(y) \rightarrow (Tx \vee y \leftrightarrow Tx \vee Ty))$$

- ▶ Therefore, it's of no use for the deflationist.

Horsten's Argument

Horsten's Premises

Why Deflationism Should be Based Upon PKF

A Tension In Horsten's Argument

Objection

How To Prove Unrestricted Generalities

Field's Theory Outruns PKF

Discussion

Horsten Rejects Field's Theory

A Better Response on Horsten's Behalf

What's So Bad About Meta-Theory?

The Supposed Semantic Self-Sufficiency of Ordinary Discourse

Proposal

References

The Failure of the Compositional Theory of Truth

Inferentialist
Deflationism
Jönne Speck

- ▶ Take the universally quantified principles as axioms: The compositional theory ('TC').
- ▶ But it does not prove the universally quantified principle of iteration:

$$\forall x(\text{Sent}_a(x) \rightarrow (Tx \rightarrow TTx))$$

Horsten's Argument

Horsten's Premises

Why Deflationism Should be Based Upon PKF

A Tension In Horsten's Argument

Objection

How To Prove Unrestricted Generalities

Field's Theory Outruns PKF

Discussion

Horsten Rejects Field's Theory

A Better Response on Horsten's Behalf

What's So Bad About Meta-Theory?

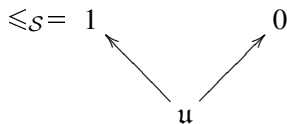
The Supposed Semantic Self-Sufficiency of Ordinary Discourse

Proposal

References

Kripke's Construction in a Nutshell: Notation

- ▶ Standard language of number theory plus truth predicate
' T ': \mathcal{L}_{at}
- ▶ Non-classical value space: $\mathcal{S} = \langle \{0, u, 1\}, \leq_{\mathcal{S}} \rangle$



- ▶ $\mathcal{V} = \{v \mid v : \text{Sent}_{at} \mapsto \mathcal{S}\}$
- ▶ $v \leq_{\mathcal{V}} v'$ iff for every \mathcal{L}_{at} -sentence ϕ , $v(\phi) \leq_{\mathcal{S}} v'(\phi)$

Kripke's Construction in a Nutshell: A Bit of Algebra

- ▶ The existence of fixed point models follows from the Knaster-Tarski-theorem for coherent complete partially ordered sets ('ccpo').
- ▶ Since the value space \mathcal{S} is a ccpo, \mathcal{V} is, too [?, lemma 7]
- ▶ Strong Kleene logic for $\mathcal{L}_{at} \setminus \mathcal{L}_a$ -sentences provides a *monotone*¹ operator $K : \mathcal{V} \mapsto \mathcal{V}$

¹See appendix ??

Horsten's Argument

Horsten's Premises

Why Deflationism Should be Based Upon PKF

A Tension In Horsten's Argument

Objection

How To Prove Unrestricted Generalities

Field's Theory Outruns PKF

Discussion

Horsten Rejects Field's Theory

A Better Response on Horsten's Behalf

What's So Bad About Meta-Theory?

The Supposed Semantic Self-Sufficiency of Ordinary Discourse

Proposal

References

Kripke's Construction in a Nutshell: The 'Kripke Jump'

- ▶ Let $m(\phi)$ be the value of the \mathcal{L}_a -sentence ϕ in the standard model.

$$\mathbf{K1} \quad K(v)(\phi) = m(\phi) \text{ for } \phi \notin \text{Sent}_t$$

$$\mathbf{K2} \quad K(v)(T^r \psi^1) = v(\psi)$$

$$\mathbf{K3} \quad K(v)(\neg\psi) = 1 - K(v)(\psi)$$

$$\mathbf{K4} \quad K(v)(\psi \vee \chi) = \max\{K(v)(\psi), K(v)(\chi)\}$$

$$\mathbf{K5} \quad K(v)(\forall x\psi) = \min\{K(v)(\psi(t/x)) \mid t \text{ closed term}\}$$

Horsten's Argument

Horsten's Premises

**Why Deflationism Should be
Based Upon PKF**

A Tension In Horsten's
Argument

Objection

How To Prove Unrestricted
Generalities

Field's Theory Outruns PKF

Discussion

Horsten Rejects Field's Theory

A Better Response on
Horsten's Behalf

What's So Bad About
Meta-Theory?

The Supposed Semantic
Self-Sufficiency of Ordinary
Discourse

Proposal

References

Kripke's Theory

- ▶ The theory of Kripke's fixed points contains compositionality and iteration as universal quantifications over arithmetical sentences.
- ▶ But Horsten rejects Kripke's theory because it is defined in a meta-theory.
- ▶ The deflationist needs an *axiomatization*.

Inferentialist

Deflationism

Jönne Speck

Horsten's Argument

Horsten's Premises

Why Deflationism Should be Based Upon PKF

A Tension In Horsten's Argument

Objection

How To Prove Unrestricted Generalities

Field's Theory Outruns PKF

Discussion

Horsten Rejects Field's Theory

A Better Response on Horsten's Behalf

What's So Bad About Meta-Theory?

The Supposed Semantic Self-Sufficiency of Ordinary Discourse

Proposal

References

Axiomatizing Kripke's Theory

- ▶ Strictly speaking, Kripke's theory is not axiomatizable.
- ▶ Choose inference rules corresponding to the clauses of the inductive definition [Halbach and Horsten, 2006, §4], [Horsten, 2009, p. 574].

Inferentialist
Deflationism
Jönne Speck

Horsten's Argument

Horsten's Premises

**Why Deflationism Should be
Based Upon PKF**

A Tension In Horsten's
Argument

Objection

How To Prove Unrestricted
Generalities

Field's Theory Outruns PKF

Discussion

Horsten Rejects Field's Theory

A Better Response on
Horsten's Behalf

What's So Bad About
Meta-Theory?

The Supposed Semantic
Self-Sufficiency of Ordinary
Discourse

Proposal

References

The Truth Rules of PKF

$$\frac{Vl(x)=Vl(y) \quad ClTerm(x) \quad ClTerm(y)}{Tx=y}$$

$$\frac{\frac{T(Vl(x)) \quad ClTerm(x)}{T(T(x))} \quad ClTerm(x) \quad \frac{T(x)}{Sent(x)}}{Sent(x)}$$

$$\frac{\frac{\neg T(x) \quad Sent_{at}(x)}{T\neg x} \quad \frac{T(x) \vee T(y) \quad Sent_{at}(x) \quad Sent(y)}{Tx \vee y \quad Sent_{at}(x) \quad Sent(y)}}{Sent_{at}(x) \quad Sent(y)}$$

$$\frac{\forall z TSubst(\ulcorner z \urcorner, y, x) \quad Free_{at}(x) \quad Var_{at}(y)}{T\forall(x, y)}$$

Inferentialist
Deflationism
Jönne Speck

Horsten's Argument

Horsten's Premises

Why Deflationism Should be
Based Upon PKF

A Tension In Horsten's
Argument

Objection

How To Prove Unrestricted
Generalities

Field's Theory Outruns PKF

Discussion

Horsten Rejects Field's Theory

A Better Response on
Horsten's Behalf

What's So Bad About
Meta-Theory?

The Supposed Semantic
Self-Sufficiency of Ordinary
Discourse

Proposal

References

Why PKF is the Best Formal Theory (Currently Available)

- ▶ For any $\alpha < \omega^\omega$, PKF proves
- ▶ Compositionality:

$$\forall x \forall y (\text{Sent}_{at}^\alpha(x) \wedge \text{Sent}_{at}^\alpha(y) \rightarrow (T_{\alpha+1}(x \vee y) \leftrightarrow (T_{\alpha+1}x \vee T_{\alpha+1}y)))$$

- ▶ Iteration:

$$\forall \beta < \alpha \forall x (\text{Sent}_\beta(x) \rightarrow (T_\alpha x \rightarrow T_\beta \text{Sent}_\alpha(x)))$$

- ▶ Thus, PKF proves much more universally quantified principles of truth than DT and TC.

Horsten's Argument

Horsten's Premises

Why Deflationism Should be
Based Upon PKF

A Tension In Horsten's
Argument

Objection

How To Prove Unrestricted
Generalities

Field's Theory Outruns PKF

Discussion

Horsten Rejects Field's Theory

A Better Response on
Horsten's Behalf

What's So Bad About
Meta-Theory?

The Supposed Semantic
Self-Sufficiency of Ordinary
Discourse

Proposal

References

The Third Premise: A Fact About PKF

- ▶ In the Kripke fixed point models ungrounded sentences are not ascribed a classical truth value.
- ▶ No universal quantification into the predicate ‘ T ’ over every sentence of the language can be true in the fixed point models.
- ▶ But PKF is closed under inference rules.

$$T\text{-Intro} \frac{\phi}{T^{\ulcorner}\phi^{\urcorner}} \quad \frac{T^{\ulcorner}\phi^{\urcorner}}{\phi} T\text{-Elim}$$

Horsten's Argument

Horsten's Premises

Why Deflationism Should be
Based Upon PKF

A Tension In Horsten's
Argument

Objection

How To Prove Unrestricted
Generalities

Field's Theory Outruns PKF

Discussion

Horsten Rejects Field's Theory

A Better Response on
Horsten's Behalf

What's So Bad About
Meta-Theory?

The Supposed Semantic
Self-Sufficiency of Ordinary
Discourse

Proposal

References

A Tension In Horsten's Argument

- ▶ On one hand, Horsten thinks that the more universal quantifications into the truth predicate a theory proves, the better it is a basis for deflationism.
- ▶ On the other hand, Horsten's argument presupposes that there is an upper bound to this: no sound theory proves quantifications over every sentence.

Inferentialist
Deflationism
Jönne Speck

Horsten's Argument

Horsten's Premises

Why Deflationism Should be
Based Upon PKF

**A Tension In Horsten's
Argument**

Objection

How To Prove Unrestricted
Generalities

Field's Theory Outruns PKF

Discussion

Horsten Rejects Field's Theory

A Better Response on
Horsten's Behalf

What's So Bad About
Meta-Theory?

The Supposed Semantic
Self-Sufficiency of Ordinary
Discourse

Proposal

References

Any Better Theory Likewise Only Gives Rules

Inferentialist
Deflationism
Jönne Speck

Horsten's Argument

Horsten's Premises

Why Deflationism Should be
Based Upon PKF

A Tension In Horsten's
Argument

Objection

How To Prove Unrestricted
Generalities

Field's Theory Outruns PKF

Discussion

Horsten Rejects Field's Theory

A Better Response on
Horsten's Behalf

What's So Bad About
Meta-Theory?

The Supposed Semantic
Self-Sufficiency of Ordinary
Discourse

Proposal

References

'PKF (...) only looks good until the better theory comes along. We should surely hold open the possibility that some future stronger inferential truth theory may determine the meaning of the concept of truth even further' [Horsten, 2009, p. 577]

- ▶ PKF may not be the best
- ▶ But whichever better theory may come, it, too, will be 'inferential', will still not prove general principles.

Outline

Horsten's Argument

Objection

Discussion

Proposal

Inferentialist
Deflationism
Jönne Speck

Horsten's Argument

Horsten's Premises

Why Deflationism Should be
Based Upon PKF

A Tension In Horsten's
Argument

Objection

How To Prove Unrestricted
Generalities

Field's Theory Outruns PKF

Discussion

Horsten Rejects Field's Theory

A Better Response on
Horsten's Behalf

What's So Bad About
Meta-Theory?

The Supposed Semantic
Self-Sufficiency of Ordinary
Discourse

Proposal

References

A New Conditional

- ▶ Hartry Field has recently elaborated on Kripke's theory [Field, 2003, Field, 2007, Field, 2008].
- ▶ Field extends the language with truth predicate by a binary operator ' \rightsquigarrow '
- ▶ Given a valuation c of the new sentences ' $\phi \rightsquigarrow \psi$ ', the truth predicate can be interpreted by a Kripke fixed point model.
- ▶ These valuations c make up a ccpo, on which Field defines F :

$$F(c)(\phi \rightsquigarrow \psi) = \begin{cases} 1 & \text{iff } v_f^c(\phi) \leq v_f^c(\psi) \\ 0 & \text{otherwise} \end{cases}$$

Horsten's Argument

Horsten's Premises

Why Deflationism Should be
Based Upon PKF

A Tension In Horsten's
Argument

Objection

How To Prove Unrestricted
Generalities

Field's Theory Outruns PKF

Discussion

Horsten Rejects Field's Theory

A Better Response on
Horsten's Behalf

What's So Bad About
Meta-Theory?

The Supposed Semantic
Self-Sufficiency of Ordinary
Discourse

Proposal

References

A Revision Sequence of Fixed Points

- ▶ F does not have fixed points
- ▶ But, some values *stabilize*.
- ▶ The ‘ultimate value’ of a sentence is 1 (0) iff its value stabilizes at 1 (0), u otherwise.
- ▶ There’s a model Δ such that in Δ every sentence has its ultimate value.

Inferentialist
Deflationism
Jönne Speck

Horsten’s Argument

Horsten’s Premises

Why Deflationism Should be
Based Upon PKF

A Tension In Horsten’s
Argument

Objection

How To Prove Unrestricted
Generalities

Field’s Theory Outruns PKF

Discussion

Horsten Rejects Field’s Theory

A Better Response on
Horsten’s Behalf

What’s So Bad About
Meta-Theory?

The Supposed Semantic
Self-Sufficiency of Ordinary
Discourse

Proposal

References

Field's Theory Proves More Principles Than PKF

- ▶ For the \rightsquigarrow -free fragment, Δ is a Kripke fixed point model. Field's theory contains PKF.
- ▶ But its logic is stronger. It contains, for *every* sentence ϕ

$$\phi \rightsquigarrow \phi$$

- ▶ Still, as in Kripke's theory, ϕ has the same value as $T^{\ulcorner}\phi^{\urcorner}$.
- ▶ Consequently, Field's theory proves

$$\forall x(\text{Sent}_{\text{at}\rightsquigarrow}(x) \rightsquigarrow (Tx \rightsquigarrow TTx))$$

- ▶ Field's theory proves the unrestricted principles of compositionality and iteration.

Horsten's Argument

Horsten's Premises

Why Deflationism Should be
Based Upon PKF

A Tension In Horsten's
Argument

Objection

How To Prove Unrestricted
Generalities

Field's Theory Outruns PKF

Discussion

Horsten Rejects Field's Theory

A Better Response on
Horsten's Behalf

What's So Bad About
Meta-Theory?

The Supposed Semantic
Self-Sufficiency of Ordinary
Discourse

Proposal

References

Why Field's Theory is a Counterexample to Horsten's Argument

- ▶ PKF is not the strongest theory,
- ▶ and Field's theory proves universal quantifications into the truth predicate, over every sentence of the extended language.
- ▶ In view of Field's work you cannot argue for inferentialist deflationism as Horsten does.

Horsten's Argument

Horsten's Premises

Why Deflationism Should be
Based Upon PKF

A Tension In Horsten's
Argument

Objection

How To Prove Unrestricted
Generalities

Field's Theory Outruns PKF

Discussion

Horsten Rejects Field's Theory

A Better Response on
Horsten's Behalf

What's So Bad About
Meta-Theory?

The Supposed Semantic
Self-Sufficiency of Ordinary
Discourse

Proposal

References

Outline

Horsten's Argument

Objection

Discussion

Proposal

Inferentialist

Deflationism

Jönne Speck

Horsten's Argument

Horsten's Premises

Why Deflationism Should be
Based Upon PKF

A Tension In Horsten's
Argument

Objection

How To Prove Unrestricted
Generalities

Field's Theory Outruns PKF

Discussion

Horsten Rejects Field's Theory

A Better Response on
Horsten's Behalf

What's So Bad About
Meta-Theory?

The Supposed Semantic
Self-Sufficiency of Ordinary
Discourse

Proposal

References

Horsten On Field

Inferentialist

Deflationism

Jönne Speck

'The truth theories that are advocated in Soames 1999 and Field 2008 are in the same (partial) spirit as the truth theory that is advocated here. But by insisting that (...) there is a sense in which all the Tarski-biconditionals are correctly assertible (Field), they do not, in my opinion, embrace the Wittgensteinian picture that is defended here as fully as they should.' [Horsten, 2009, p. 579]

- ▶ Horsten rejects Field's theory because it contains general principles about truth.
- ▶ As a response to my criticism this begs the question.

Horsten's Argument

Horsten's Premises

Why Deflationism Should be Based Upon PKF

A Tension In Horsten's Argument

Objection

How To Prove Unrestricted Generalities

Field's Theory Outruns PKF

Discussion

Horsten Rejects Field's Theory

A Better Response on Horsten's Behalf

What's So Bad About Meta-Theory?

The Supposed Semantic Self-Sufficiency of Ordinary Discourse

Proposal

References

Is \rightsquigarrow a Conditional?

- ▶ In his forthcoming *The Tarskian Turn* Horsten argues differently.
- ▶ The object-linguistic schema of *modus ponens* is not valid in Field's logic of \rightsquigarrow .

$$\phi \wedge (\phi \rightsquigarrow \psi) \rightsquigarrow \psi$$

- ▶ Hence, Horsten argues, it's no acceptable formalization of the natural language indicative conditional.
- ▶ But the PKF conditional (i.e. Strong Kleene material conditional) does not validate the schema, either.
- ▶ Moreover, Horsten's first premise does not require universally quantified conditionals.
- ▶ Even if \rightsquigarrow is no conditional, Field's theory still contains universal quantifications into 'T'.

Horsten's Argument

Horsten's Premises

Why Deflationism Should be
Based Upon PKF

A Tension In Horsten's
Argument

Objection

How To Prove Unrestricted
Generalities

Field's Theory Outruns PKF

Discussion

Horsten Rejects Field's Theory

A Better Response on
Horsten's Behalf

What's So Bad About
Meta-Theory?

The Supposed Semantic
Self-Sufficiency of Ordinary
Discourse

Proposal

References

Is \rightsquigarrow a Conditional?

- ▶ If \rightsquigarrow is no adequate formalization of the natural language conditional then

$$\forall x(\text{Sent}_{\text{at}\rightsquigarrow}(x) \rightsquigarrow (Tx \rightsquigarrow TT_x))$$

is no *principle of truth*.

- ▶ If so, Field's theory would not outrun PKF and could not disprove Horsten's assumption.
- ▶ But, Field's theory *contains* PKF: It proves every principle that PKF proves,
- ▶ *plus* the universal quantifications.

Horsten's Argument

Horsten's Premises

Why Deflationism Should be
Based Upon PKF

A Tension In Horsten's
Argument

Objection

How To Prove Unrestricted
Generalities

Field's Theory Outruns PKF

Discussion

Horsten Rejects Field's Theory

A Better Response on
Horsten's Behalf

What's So Bad About
Meta-Theory?

The Supposed Semantic
Self-Sufficiency of Ordinary
Discourse

Proposal

References

Field's Theory is no Counterexample because it is not Axiomatizable

- ▶ Deflationists need theories that formalize ordinary discourse.
- ▶ Field's theory cannot do this since it's defined in a meta-theory.
- ▶ Just as Kripke's, therefore, Field's theory is no candidate for a deflationist account of ordinary truth talk.
- ▶ Moreover, Field's theory cannot be axiomatized [Welch, 2008].

Horsten's Argument

Horsten's Premises

Why Deflationism Should be
Based Upon PKF

A Tension In Horsten's
Argument

Objection

How To Prove Unrestricted
Generalities

Field's Theory Outruns PKF

Discussion

Horsten Rejects Field's Theory

**A Better Response on
Horsten's Behalf**

What's So Bad About
Meta-Theory?

The Supposed Semantic
Self-Sufficiency of Ordinary
Discourse

Proposal

References

What's So Bad About Meta-Theory?

- ▶ Why are only *axiomatic* theories relevant for deflationism?
- ▶ Deflationists need theories that formalize ordinary discourse and
(...) *we do not have a metalanguage for English.*
[Horsten, 2009, p. 572]
- ▶ Horsten suggests this to follow from Gödel's second theorem.

Inferentialist
Deflationism
Jönne Speck

Horsten's Argument

Horsten's Premises

Why Deflationism Should be
Based Upon PKF

A Tension In Horsten's
Argument

Objection

How To Prove Unrestricted
Generalities

Field's Theory Outruns PKF

Discussion

Horsten Rejects Field's Theory

A Better Response on
Horsten's Behalf

**What's So Bad About
Meta-Theory?**

The Supposed Semantic
Self-Sufficiency of Ordinary
Discourse

Proposal

References

The Universality of Ordinary Discourse

- ▶ **Implicit assumption:** No theory is stronger than ordinary discourse.
- ▶ **A venerable thought:**
‘if we can speak meaningfully about anything at all, we can speak about it in colloquial language’
[Tarski, 1956, p. 164]
- ▶ **But false.** People don't talk PKF.

Inferentialist
Deflationism
Jönne Speck

Horsten's Argument

Horsten's Premises

Why Deflationism Should be
Based Upon PKF

A Tension In Horsten's
Argument

Objection

How To Prove Unrestricted
Generalities

Field's Theory Outruns PKF

Discussion

Horsten Rejects Field's Theory

A Better Response on
Horsten's Behalf

**What's So Bad About
Meta-Theory?**

The Supposed Semantic
Self-Sufficiency of Ordinary
Discourse

Proposal

References

The Indefinite Extensibility of Ordinary Discourse

Inferentialist
Deflationism
Jönne Speck

*‘anything whatsoever can be expressed in [natural languages] once suitable resources are added’
[Gupta and Belnap, 1993, p. 257]*

- ▶ This is true of any language, including Field’s language with \rightsquigarrow .
- ▶ It cannot help to rule out theories that are defined in a meta-theory.

Horsten’s Argument

Horsten’s Premises

Why Deflationism Should be Based Upon PKF

A Tension In Horsten’s Argument

Objection

How To Prove Unrestricted Generalities

Field’s Theory Outruns PKF

Discussion

Horsten Rejects Field’s Theory

A Better Response on Horsten’s Behalf

What’s So Bad About Meta-Theory?

The Supposed Semantic Self-Sufficiency of Ordinary Discourse

Proposal

References

Semantic Self-Sufficiency

- ▶ Meta-theory is for *semantics*.
- ▶ If ordinary discourse can do its own semantics it does not need a meta-theory.
- ▶ Thus, a theory that needs a meta-theory cannot help the deflationist as a formalization of ordinary discourse.

Inferentialist

Deflationism

Jönne Speck

Horsten's Argument

Horsten's Premises

Why Deflationism Should be Based Upon PKF

A Tension In Horsten's Argument

Objection

How To Prove Unrestricted Generalities

Field's Theory Outruns PKF

Discussion

Horsten Rejects Field's Theory

A Better Response on Horsten's Behalf

What's So Bad About Meta-Theory?

The Supposed Semantic Self-Sufficiency of Ordinary Discourse

Proposal

References

The Supposed Semantic Self-Sufficiency of Ordinary Discourse

- ▶ Semantic self-sufficiency presupposes the semantics of English (Dutch, Chinese...) to be expressed in English (Dutch, Chinese...).
- ▶ But what is English? The only reasonable approach is to focus on its *current stage*.
- ▶ Similarly, which stage of ordinary discourse is meant to provide the semantics of today's English?
- ▶ Must be today's discourse since the English of 2099 would be just a meta-language.

Horsten's Argument

Horsten's Premises

Why Deflationism Should be
Based Upon PKF

A Tension In Horsten's
Argument

Objection

How To Prove Unrestricted
Generalities

Field's Theory Outruns PKF

Discussion

Horsten Rejects Field's Theory

A Better Response on
Horsten's Behalf

What's So Bad About
Meta-Theory?

The Supposed Semantic
Self-Sufficiency of Ordinary
Discourse

Proposal

References

The Supposed Semantic Self-Sufficiency of Ordinary Discourse

- ▶ Do we have, today, a complete semantics of our own reasoning?

'In one sense, it means simply the ability to understand and use the language. In this sense it is tautological that English is comprehensible by English speakers. And nothing much follows from this triviality. In the other sense, 'comprehensibility' means the ability to give a systematic theory of English.' [Gupta, 1997, pp. 441n]

Horsten's Argument

Horsten's Premises

Why Deflationism Should be
Based Upon PKF

A Tension In Horsten's
Argument

Objection

How To Prove Unrestricted
Generalities

Field's Theory Outruns PKF

Discussion

Horsten Rejects Field's Theory

A Better Response on
Horsten's Behalf

What's So Bad About
Meta-Theory?

The Supposed Semantic
Self-Sufficiency of Ordinary
Discourse

Proposal

References

The Supposed Semantic Self-Sufficiency of Ordinary Discourse

- ▶ Horsten's argument for inferentialist deflationism goes through only if ordinary speakers are capable, today, of providing a complete, scientific semantics of their reasoning.

Inferentialist
Deflationism
Jönne Speck

Horsten's Argument

Horsten's Premises

Why Deflationism Should be
Based Upon PKF

A Tension In Horsten's
Argument

Objection

How To Prove Unrestricted
Generalities

Field's Theory Outruns PKF

Discussion

Horsten Rejects Field's Theory

A Better Response on
Horsten's Behalf

What's So Bad About
Meta-Theory?

**The Supposed Semantic
Self-Sufficiency of Ordinary
Discourse**

Proposal

References

Outline

Horsten's Argument

Objection

Discussion

Proposal

Inferentialist

Deflationism

Jönne Speck

Horsten's Argument

Horsten's Premises

Why Deflationism Should be
Based Upon PKF

A Tension In Horsten's
Argument

Objection

How To Prove Unrestricted
Generalities

Field's Theory Outruns PKF

Discussion

Horsten Rejects Field's Theory

A Better Response on
Horsten's Behalf

What's So Bad About
Meta-Theory?

The Supposed Semantic
Self-Sufficiency of Ordinary
Discourse

Proposal

References

Taking Seriously Our *Philosophical* Perspective

- ▶ One cannot, as Horsten does, reject semantical theories of truth *tout court*.
- ▶ A more fine-grained criterion is needed to decide on which theory to build our philosophy of truth.
- ▶ How about *philosophical motivation*?

Inferentialist
Deflationism
Jönne Speck

Horsten's Argument

Horsten's Premises

Why Deflationism Should be
Based Upon PKF

A Tension In Horsten's
Argument

Objection

How To Prove Unrestricted
Generalities

Field's Theory Outruns PKF

Discussion

Horsten Rejects Field's Theory

A Better Response on
Horsten's Behalf

What's So Bad About
Meta-Theory?

The Supposed Semantic
Self-Sufficiency of Ordinary
Discourse

Proposal

References

Field's Construction Lacks Motivation

- ▶ Revision-theory has been motivated for an account of *truth* [?, ?, Gupta and Belnap, 1993].
- ▶ It doesn't carry over to Field's definition of \rightsquigarrow .
- ▶ Confronted with a conditional, we look at its antecedent and consequent: We don't just ascribe an arbitrary value to it.
- ▶ Field's usage of revision theory is just a technical trick to strengthen the logic, not philosophically motivated.

Inferentialist
Deflationism
Jönne Speck

Horsten's Argument

Horsten's Premises

Why Deflationism Should be
Based Upon PKF

A Tension In Horsten's
Argument

Objection

How To Prove Unrestricted
Generalities

Field's Theory Outruns PKF

Discussion

Horsten Rejects Field's Theory

A Better Response on
Horsten's Behalf

What's So Bad About
Meta-Theory?

The Supposed Semantic
Self-Sufficiency of Ordinary
Discourse

Proposal

References

Kripke's Thought Experiment

- ▶ A speaker of English⁻ = English \ { 'true' } is confronted with sentences containing 'true' [?, p. 701].
- ▶ She is told: If you can assert ϕ then you're entitled to assert ' ϕ is true'.
- ▶ Iterating this principle, she learns to ascribe 'true' also to sentence that contain it themselves.
- ▶ At some point, the principle will not any longer extend her knowledge.

Inferentialist
Deflationism
Jönne Speck

Horsten's Argument

Horsten's Premises

Why Deflationism Should be
Based Upon PKF

A Tension In Horsten's
Argument

Objection

How To Prove Unrestricted
Generalities

Field's Theory Outruns PKF

Discussion

Horsten Rejects Field's Theory

A Better Response on
Horsten's Behalf

What's So Bad About
Meta-Theory?

The Supposed Semantic
Self-Sufficiency of Ordinary
Discourse

Proposal

References

Grounded Truth

- ▶ At this point of completion, the sentences with ‘true’ the speaker comes to understand are *grounded*:
- ▶ Their value depends entirely on the values of sentences without truth predicate.
- ▶ A grounded theory of truth can be defended from non-semantic facts.
- ▶ The deflationist should go for grounded theories.

Inferentialist
Deflationism
Jönne Speck

Horsten's Argument

Horsten's Premises

Why Deflationism Should be
Based Upon PKF

A Tension In Horsten's
Argument

Objection

How To Prove Unrestricted
Generalities

Field's Theory Outruns PKF

Discussion

Horsten Rejects Field's Theory

A Better Response on
Horsten's Behalf

What's So Bad About
Meta-Theory?

The Supposed Semantic
Self-Sufficiency of Ordinary
Discourse

Proposal

References

How the Fixed Point Models Capture Grounded Truth

- ▶ The *Kripke jump* K gives rise to a sequence:

$$v_0 = m \tag{1}$$

$$v_{\alpha+1} = K((v)_\alpha) \tag{2}$$

$$v_\lambda = \liminf_{\alpha \rightarrow \lambda} v_\alpha \tag{3}$$

- ▶ This sequence formalizes the *learning process*:
- ▶ v_0 : The beginning when the speaker doesn't understand the truth predicate.
- ▶ v_α : She understands its meaning better and better.
- ▶ The least fixed point $v_{f0} = K(v_{f0})$: Learning target achieved.

Horsten's Argument

Horsten's Premises

Why Deflationism Should be
Based Upon PKF

A Tension In Horsten's
Argument

Objection

How To Prove Unrestricted
Generalities

Field's Theory Outruns PKF

Discussion

Horsten Rejects Field's Theory

A Better Response on
Horsten's Behalf

What's So Bad About
Meta-Theory?

The Supposed Semantic
Self-Sufficiency of Ordinary
Discourse

Proposal

References

Models of Grounded Truth

- ▶ If $v_{f_0}(\phi) = 1$ then ϕ *grounded*.
- ▶ The apparent *weakness* of Kripke's theory becomes a *strength*:
- ▶ $\forall x(\text{Sent}_{at\rightsquigarrow}(x) \rightsquigarrow (Tx \rightsquigarrow TTx))$ is *ungrounded*.
- ▶ We (deflationists) don't want our theory to be ungrounded.

Inferentialist
Deflationism
Jönne Speck

Horsten's Argument

Horsten's Premises

Why Deflationism Should be
Based Upon PKF

A Tension In Horsten's
Argument

Objection

How To Prove Unrestricted
Generalities

Field's Theory Outruns PKF

Discussion

Horsten Rejects Field's Theory

A Better Response on
Horsten's Behalf

What's So Bad About
Meta-Theory?

The Supposed Semantic
Self-Sufficiency of Ordinary
Discourse

Proposal

References

How To Argue for Inferentialist Deflationism

Inferentialist
Deflationism
Jönne Speck

- ▶ Thus, Kripke's semantics is philosophically well motivated whereas Field's isn't.
- ▶ This is a principled argument for Kripke's theory.
- ▶ Kripke's theory now allows for Horsten's *Inferentialist Deflationism*.
- ▶ It doesn't contain contain unrestricted principles of truth but is closed under unrestricted inference rules.

Horsten's Argument

Horsten's Premises

Why Deflationism Should be
Based Upon PKF

A Tension In Horsten's
Argument

Objection

How To Prove Unrestricted
Generalities

Field's Theory Outruns PKF

Discussion

Horsten Rejects Field's Theory

A Better Response on
Horsten's Behalf

What's So Bad About
Meta-Theory?

The Supposed Semantic
Self-Sufficiency of Ordinary
Discourse

Proposal

References



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Horsten's Argument

Horsten's Premises

Why Deflationism Should be
Based Upon PKF

A Tension In Horsten's
Argument

Objection

How To Prove Unrestricted
Generalities

Field's Theory Outruns PKF

Discussion

Horsten Rejects Field's Theory

A Better Response on
Horsten's Behalf

What's So Bad About
Meta-Theory?

The Supposed Semantic
Self-Sufficiency of Ordinary
Discourse

Proposal

References



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Inferentialist
Deflationism
Jönne Speck

Horsten's Argument

Horsten's Premises

Why Deflationism Should be
Based Upon PKF

A Tension In Horsten's
Argument

Objection

How To Prove Unrestricted
Generalities

Field's Theory Outruns PKF

Discussion

Horsten Rejects Field's Theory

A Better Response on
Horsten's Behalf

What's So Bad About
Meta-Theory?

The Supposed Semantic
Self-Sufficiency of Ordinary
Discourse

Proposal

References

The Inferential Character of PKF: No Axioms...

- ▶ The third premise becomes:

P3' Necessarily, the truth predicate of PKF is not governed by axioms but merely by inference rules.

- ▶ Horsten specifies this:

'PKF proves no unrestricted generalities about truth; for example, it does not provide a proof of any sentence of the form $\forall \phi \in L_T : T(\dots\phi\dots) \rightarrow T(\dots\phi\dots)$ (...)' [Horsten, 2009, p. 574]

- ▶ An 'unrestricted generality':

$$\forall x \forall y (Sent_{at}(x) \wedge Sent_{at}(y) \rightarrow (Tx \vee y \leftrightarrow Tx \vee Ty))$$

- ▶ No unrestricted generality:

Appendix

Horsten's Understanding of
'Unrestricted Generalities'

Kripke's Fixed Point Models
and their Theory

KF

PKF

The Inferential Character of PKF: ... But Rules

'(...) PKF contains lots of unrestricted rules of inference concerning truth.'

$$'T\neg\phi \Rightarrow \neg T\phi'$$

$$\frac{T\neg x \quad Sent_{at}(x)}{\neg Tx}$$

P3'' PKF does not prove universal quantifications into the truth predicate over all \mathcal{L}_{at} -sentences, but is closed under inference rules where for any variable \vec{x} within the scope of ' T ', $Sent_{at}(\vec{x})$ is a premise, too.

Appendix

Horsten's Understanding of
'Unrestricted Generalities'

Kripke's Fixed Point Models
and their Theory

KF

PKF

Monotonicity of K

Assume $v \leqslant_{\mathcal{V}} v'$. K is monotone iff for every sentence $\phi, K(v)(\phi) \leqslant_{\mathcal{S}} K(v')(\phi)$. This is shown by induction on the complexity of ϕ . An atomic ϕ is either not in $Sent_t$, then $K(v)(\phi) = m(\phi) = K(v')(\phi)$, or it is $T^{\Gamma}\psi^{\Gamma}$, in which case $K(v)(\phi) = v(\psi) \leqslant v'(\psi) = K(v')(\phi)$. Now consider complex ϕ , for any sub-sentence ψ of which, $K(v)(\psi) \leqslant K(v')(\psi)$. If ϕ is $\neg\psi$ then assume $K(v)(\phi) > K(v')(\phi)$. Due to the value space \mathcal{S} , $K(v)(\phi)$ must be 1 or 0, and $K(v')(\phi) = u$. Hence $K(v')(\psi) = u < K(v)(\psi)$, contrary to the induction assumption. Hence $K(v)(\phi) \leqslant K(v')(\phi)$. If ϕ is $\psi \vee \chi$ then assume $K(v)(\psi \vee \chi) > K(v')(\psi \vee \chi)$. Hence $\max\{K(v)(\psi), K(v)(\chi)\} > \max\{K(v')(\psi), K(v')(\chi)\}$. But $K(v')(\psi) \geqslant K(v)(\psi)$ and $K(v')(\chi) \geqslant K(v)(\chi)$, contradiction. Hence $K(v)(\phi) \leqslant K(v')(\phi)$ and K is monotone.

Appendix

Horsten's Understanding of
'Unrestricted Generalities'

Kripke's Fixed Point Models
and their Theory

KF

PKF

Appendix

Horsten's Understanding of
'Unrestricted Generalities'

Kripke's Fixed Point Models
and their Theory

KF

PKF

- ▶ Classical Natural Deduction, except that \rightarrow I is replaced by \xrightarrow{w} I.

$$\xrightarrow{w}\text{I},0 \frac{\begin{array}{c} [\phi^0] \\ \mathcal{D} \\ \psi \end{array} \quad T^{\ulcorner \phi^{\urcorner}} \vee T^{\ulcorner \neg \phi^{\urcorner}}}{\phi \rightarrow \psi}$$

Appendix

Horsten's Understanding of
'Unrestricted Generalities'

Kripke's Fixed Point Models
and their Theory

KF

PKF

- ▶ PKF does not contain the induction axioms but an induction rule:

$$\text{IND}_{0,1} \frac{[\phi(x)]^1 \quad \mathcal{D} \quad \phi(x+1) \quad [\phi(\bar{0})]^0}{\forall x \phi(x)}$$

- ▶ ϕ may contain the truth predicate.
- ▶ Arithmetical induction extended to truth.