Understanding defective theories: From logic to epistemology

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∗This work is part of a larger project with Moisés Mac ías-Bustos in which we explore the possibility of achieving understanding of defective theories in the empirical sciences.

Can logicians achieve legitimate understanding of *defective** theories?

if so, how is this possible?

Yes. Logicians understand a defective theory when they can recognize the theory's underlying inference pattern(s) (…)

*Defective: partial, vague, conflictive, inconsistent, and false.

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Plan

1. Preliminaries on understanding for logicians
2. Understanding and falsehoods (and other defects)
3. What are logicians doing?
4. Final remarks

Preliminaries (I)

- **Understanding:** "consist of knowledge about relations of dependence. When one understands something, one can make all kinds of correct inferences about it" (Ylikoski, 2013: 100).
  - It is often regarded as factive, this is, the content of understanding can only include true propositions that are known to be so.

- The content of understanding:

Factivism | Quasi-factivism | Non-factivism

Preliminaries (II)

- Defective information:
  - partial, vague, conflictive, inconsistent, and false.
  - much current scientific practice makes use of defective information (cf. Bueno 1997, 1999, 2006, 2011, 2017; da Costa and French 2002, 2003; Priest 2002)

  - Inconsistent:
    - Aristotle's Theory of Motion
    - Bohr's theory of the Atom
    - Classical Electrodynamics
    - Classical Mechanics (T-O)
    - Early Calculus
    - Nineteenth century physics/geology

Preliminaries (III)

[Ground spiritual assumption]

- Anti-exceptionalism about logic
  - Logic isn't special. Its theories are continuous with science; its method continuous with scientific method (…) Logical theories are revisable, and if they are revised, they are revised on the same grounds as scientific theories.

(Hjortlan 2017: 1)

Preliminaries (IV)

- *Can logicians achieve legitimate understanding of defective theories?*
  - Defective theories – Non-defective phenomena.
  - Defective phenomena –Defective theories.

  - Worries:
    - Theoretical (about the theories)
    - App (about the domain)

Defective ths. ≠ felicitous falsehoods

- **Felicitous falsehoods:**

  facilitate understanding by virtue of being the falsehoods they are: "[...] their divergence from truth or representational accuracy fosters their epistemic functioning" (Elgin 2017: 1).

  + (empirical) success.

  – *Content question:* How do the falsehoods (or the models that involve them) figure into the content of understanding the phenomenon? (Lawler 2019: 7)

Defective ths. ≠ felicitous falsehoods

- **Felicitous falsehoods:**

  facilitate understanding by virtue of being the falsehoods they are: "[...] their divergence from truth or representational accuracy fosters their epistemic functioning" (Elgin 2017: 1).

  + empirical success.

- **Defective theories:**
  - Are theoretical constructs which operate on a defective basis –either assuming incompatible commitments, accepting defective procedures or characterizing defective entities (etc).
  - Can preserve and stress particular inference patterns between propositions—and it is expected that such patterns warrant the success of the theory in different contexts.

(Tuned) thesis

- Logicians understand a defective theory when they can recognize the theory's underlying inference pattern(s) (…)
  - **Structure:** helps to connect the defective elements in such a way that they remain defective but non-dangerous (problematic).
  - **It** must be included as part of the content of understanding

Sketching the view

The structuralist character of the view comes from granting that:

> What scientists really study are not any objects and their properties, but certain general inference relations or inference patterns (…) What exactly does speaking of 'inference relations' here involve; in particular, what are the relata: mere sentences (so that we are back to some kind of formalism?), propositions (leading us beyond formalism after all?), etc.? (Reck and Price 2000: pp. 347–348)

According to this view, one of the main tasks of scientific theories is to preserve and stress particular inference patterns between propositions—and it is expected that such patterns warrant the success of the theory in different context.

What are logicians doing?

Accommodating elements in such a way that satisfies certain criteria:

– e.g., Evidence and Strenght

(Hjortlan, 2017)

Elegant disclaimer: this is not the *only* thing that logicians do nor the highly most important task of logic.

Which problem are they dealing with?

- *Can logicians achieve legitimate understanding of defective theories?*
  - Defective theories – Non-defective phenomena.
  - Defective phenomena –Defective theories.

Factual ignorance

Failure at assigning an alethic value to *x*

What causes the problem?

Ignorance of theoretical structure

Lacking knowledge of the (relevant) inference patterns that scientific theories allow for. When ignoring (the relevant parts of) the theoretical structure of a theory, scientists are not capable of grasping abstract causal connections between the propositions of their theory, they can neither identify the logical consequences of the propositions that they are working with nor can explain under which conditions the truth value of such propositions will be false. (Martínez-Ordaz 2020: 12)

Factual ignorance

Failure at assigning an alethic value to *x*

- When (scientists and) logicians master specific inference patterns within a particular domain, what they gain is a way to structure and follow successfully certain inferences in their day to-day practice; this is, not only that they can use inferential rules in an effective way but also that they can explain under which circumstances and why certain inferential rules are reliable in a domain of application of their theory.

- For this reason, when falsehoods (or any other defective elements are expected to be included in the content of understanding, they must be joined by the inference patterns that allow them to remain well behaved.

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(Pre)Summing up

- **Structure:** helps to connect the defective elements in such a way that they remain defective but non-dangerous (problematic).
  - It *must* be included as part of the content of understanding

When dealing with ignorance of th str

What are logicians doing?

Accommodating elements in such a way that satisfies certain criteria:

- e.g., Evidence and Strenght
- Behaves *as consistently as possible*.
- …

What are logicians doing?

- Evidence
  - I just want to mention one major source of evidence that will be important in what follows: theories of truth.
    - One is the connection between truth preservation and validity: e.g., paradoxes → non classical
- Strenght
  - What, for instance, is the connection between deductive strength and explanatory power?

What are logicians getting?

At least

- Modal understanding
  - Which means that one can have a clear picture of the set of possible worlds that correspond to the causal structural connections that are relevant only with respect to some domain of the possibility space associated with the phenomena in question.

- But structures cannot be true.

Sketching the view

- What is understood in cases of defective theories is, broadly speaking, that some structure is being posited of some objects in some domain for the purposes of saying explanatory things about them given the posited structure.

  - But structures cannot be true/false.

Final remarks

1. Defective ths. ≠ felicitous falsehoods
   - Structure

2. Ignorance of theoretical structure → factive ignorance → toleration of defects

3. When falsehoods (or any other defective elements) are included in the content of understanding, they must be joined by the inference patterns that allow them to remain well behaved.

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± open questions

1. If epistemic practices in (non-classical) logic can shed light on epistemic practices in the sciences, would this support any standpoint from the traditional [exceptionalism /anti-exceptionalism] debate?

2. Which constraints will the empirical character of some scientific disciplines impose on the view (as so far it aims at being a non-factivist approach)?

3. Which, if any, can be the normative character that logics might play for the achievement of understanding in the sciences?

4. How to deal with the traditional challenges that any structuralist view faces when addressing the problem of understanding? Which additional elements are needed?

Thank you!

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