Empirical Content and Its Presuppositions

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Plan of the talk:

1. Empirical Content: A Preliminary Model
2. Externalist vs. Internalist Empirical Content
3. Expressing Internalist Empirical Content
4. Presuppositions of Empirical Content
5. A Phenomenalist Basis
6. Adding Structuralism
7. Final Heresies

Empirical Content: A Preliminary Model

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So we assume a *context principle* for predicates and singular terms.

We do not assume meaning/content to be exhausted by empirical content.

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The content $C(\varphi)$ of a *sentence* φ in $\mathcal{L}$ is a set of worlds in W.

The content $C(P)$ of a *predicate* P in $\mathcal{L}$ is a function that assigns to each world in W a set of (tuples of) individuals in that world.

The content $C(t)$ of an *individual constant* t is a function that assigns to each world in W an individual in that world.

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Whatever interpretation is assigned to "experiential substructures", they should end up having some *epistemically distinguished* status.

But what could be more distinguished than our *a priori* access to mathematics?

So here is what we mean by empirical content (this is going to be refined later):

- Empirical content $EC(\varphi)$ of a *sentence* φ:

  set of experiential substructures of worlds in which φ is true.

  Equivalently: the function which assigns 1 to the experiential substructures of worlds in which φ is true, and which assigns 0 to all other experiential substructures.

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- Empirical content $EC(P)$ of a *predicate* P:

  a function which assigns to each experiential substructure a set of (tuples of) objects within that substructure, such that this function makes the "right" semantic contribution to the empirical contents of sentences in which P occurs.

- Empirical content $EC(t)$ of an *individual constant* t:

  a function which assigns to each experiential substructure an object within that substructure, such that this function makes the "right" semantic contribution to the empirical contents of sentences in which t occurs.

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At this point, we can e.g. define for sentences φ, ψ in $\mathcal{L}$:

1. φ is *empirically significant* iff $EC(\varphi) \neq W$, $EC(\varphi) \neq \emptyset$.
2. φ is *empirically adequate* iff
   the experiential substructure of $\mathfrak{M}^{act}$ is a member of $EC(\varphi)$.
3. φ is *empirically equivalent* with ψ iff $EC(\varphi) = EC(\psi)$.
4. φ is *empirically underdetermined* iff there is a sentence φ' in $\mathcal{L}$, such that $C(\varphi) \neq C(\varphi')$, but $EC(\varphi) = EC(\varphi')$.

(None of this is particularly surprising.)

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- *Internalist* empirical content:

  Let us assume, James Ladyman has never met Michael Friedman before.

  For him, the meaning of '**Michael Friedman**' is given by something like:

  '**The author of *Foundations of Space-Time Theories*, who is a Kant and Carnap specialist, who wears glasses (as Hannes told me),**...'

  Consequently, the empirical content of '**Michael Friedman is sitting over there**' *for James* would include something like:

  '**Someone is sitting over there, who wears glasses, who nods when asked "Do you like Carnap?",**...'

- *Externalist* empirical content:

  But, independently of what is epistemically accessible to James, 'Michael Friedman' refers to Michael Friedman.

  So, the empirical content of **'Michael Friedman is sitting over there'** would additionally have to include:

  'Someone is sitting over there, who has blisters from climbing, who nods when asked "Do you like Cassirer?",. . .'

(Something similar can be said for *predicates P*.)

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In the formal model, this can be captured by interpreting the worlds in W as

- *Epistemically possible* (from the viewpoint of a cognitive agent), or
- *Metaphysically / physically possible*.

The former is internalist, the latter externalist.

In the externalist case,

- the empirical content of a sentence φ may depend on causal or social factors that are beyond one's epistemic reach;
- hence, one needs science to get to know the empirical content of φ.

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Consequence: For each world $\mathfrak{M} = \langle D, \mathfrak{I} \rangle$ in W, assume that only the empirical substructure of $\mathfrak{M}$ is immediately epistemically accessible to our agent, i.e., accessible by non-theoretical means.

Then, the agent's only access to the members of $D \setminus (D_E \cup D_S)$ and to the interpretations of signs in $\mathcal{L} \setminus \mathcal{L}_E$ is *on grounds of a scientific theory*.

Expressing Internalist Empirical Content

Our internalist empirical contents have been introduced as sets defined over W, where W is the set of (agent-relative) epistemically possible worlds.

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Let Φ in $\mathcal{L}$ be fixed; think of Φ as being a theory that *introduces* all primitive expressions in $\mathcal{L} \setminus \mathcal{L}_E$. Let $\psi \in \mathcal{L}$, and let φ be $\Phi \wedge \psi$.

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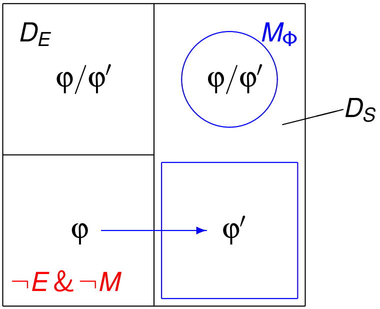
By our internalist presumption, if $\mathfrak{M} = \langle D, \mathfrak{I} \rangle$ is a world in W, and if $\mathfrak{M}' = \langle D, \mathfrak{I}' \rangle$ is another $\mathcal{L}$-model, s.t. (i) $\mathfrak{M}$ and $\mathfrak{M}'$ have the same empirical substructure, (ii) Φ is true in $\mathfrak{M}'$, and (iii) $\mathfrak{M}'$ satisfies the constraints on the next slide that apply to worlds in W generally, then:

$\mathfrak{M}'$ must also be a member of W.

Now we are going to construct a sentence φ' in $\mathcal{L}_E$ from our given φ in $\mathcal{L}$, such that φ' expresses the empirical content of φ:



$$\varphi \mapsto \varphi'$$

(The details are slightly more messy...)

We assume that there are predicates E ('experiential'), M ('mathematical'), M_Φ ('mathematical in Φ') and a constant $\#_T$ ('number') in $\mathcal{L}_E$, as well as a predicate T ('theoretical') in $\mathcal{L} \setminus \mathcal{L}_E$, such that:

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(i) $\mathfrak{I}(E) = D_E$ for all $\mathfrak{M} = \langle D, \mathfrak{I} \rangle$ in W.

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(iii) $\mathfrak{I}(M_\Phi)$ is some pure set in D_S for all $\mathfrak{M} = \langle D, \mathfrak{I} \rangle$ in W.

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(v) If P is a predicate in $\mathcal{L}$, then $\mathfrak{I}(P)$ applies to (tuples of) members of $\mathfrak{I}(E) \cup \mathfrak{I}(M_\Phi) \cup \mathfrak{I}(T)$.

(vi) If t is an individual constant in $\mathcal{L}$, then $\mathfrak{I}(t)$ is a member of $\mathfrak{I}(E) \cup \mathfrak{I}(M_\Phi) \cup \mathfrak{I}(T)$.

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(vii) $\mathfrak{I}(T)$ has the same cardinality $\mathfrak{I}(\#_T) \in D_S$ for all $\mathfrak{M} = \langle D, \mathfrak{I} \rangle$ in W, i.e., the cardinality of non-experiential & non-mathematical objects is fixed.

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Finally, we assume that M does not occur in φ, and that every quantifier in φ is restricted by $(E(x) \vee M_\Phi(x) \vee T(x))$.

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Note: the *same* method of replacement applies to *any* sentence $\mathcal{L}$ (as long as the theory Φ is kept fixed). So this is a *uniform* recipe!

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- The method of constructing φ' from φ is of course a version of Ramsification (Ramsey 1931, Carnap 1966). However:
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  - Standard Ramsification is subject to the *Newman problem* (Newman 1929, Demopoulos & Friedman 1985, Ketland 2004), if Ramsification aims to preserve meaning; but we only aim to preserve empirical content.
- Concerning van Fraassen's (1976) criticism of the syntactic approach:

  If φ' is true in $\mathfrak{M}$, and φ' logically implies $\exists x(\neg E(x) \wedge \neg M_\Phi(x))$, then this is witnessed by a *mathematical object* (not by a quantum particle or by absolute space or...).

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$$\varepsilon x \alpha[x]$$

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If $\varphi \in \mathcal{L}$, and φ'' is $\varphi[t_1'', \ldots, P_1'', \ldots, T'']$, then one can show again:

- φ'' is a sentence in $\mathcal{L}_E$, and $EC(\varphi'') = EC(\varphi)$.

Remarks:

- Let $EC(P)$ and $EC(t)$ of predicates P and terms t in $\mathcal{L}$ be chosen to be the functions that map empirical substructures to the corresponding denotations of P'' and t'' within them (respectively):

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- This approach is closely related to Lewis' (1970) definitions of theoretical terms by definite description (see also Papineau 1996), except for:

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  (By the way: Carnap employed Lewis' strategy in §155 of the *Aufbau*.)

- Quine's *holistic* intuitions about empirical content are partially vindicated (cf. Schurz 2005), but this does not contradict the *Aufbau* programme:

  "If we can aspire to a sort of *logischer Aufbau der Welt* at all, it must be one in which the texts slated for translation into observational and logico-mathematical terms are mostly broad theories taken as wholes. [. . .]
  The translation of a theory would be a ponderous axiomatization of all the experiential difference that the truth of the theory would make. . . we may, following Peirce, still fairly call this the empirical meaning of theories" (Quine 1969).

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- Our translation manual is not based on analytic statements nor is it meant to be so. But it is *a priori* (and it is theory-relative).

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- Extend our previous model by allowing primitive signs in $\mathcal{L}$ to be *undefined* in worlds in W.
- Assume a sentence to be *undefined* in a world iff any part of it is undefined in that world.
- Suppose all primitive terms in $\mathcal{L} \setminus \mathcal{L}_E$ to be *undefined* in $\mathfrak{M}$ only if the theory (fragment) by which they are introduced is false in $\mathfrak{M}$.

For $\varphi \in \mathcal{L}$, we can then define:

- The positive empirical content $EC^{+}(\varphi)$ $(= EC(\varphi))$ of φ is the set of empirical substructures of worlds in W in which φ is true.
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If not, then φ can have presuppositions which are *not* epistemically necessary. *Relativized a priori!?* See Reichenbach (1920), Friedman (1994, 2001).

A Phenomenalist Basis

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Choosing *phenomenalist* experiential substructures – as Carnap did in part of the *Aufbau* – is unpopular, but it should not be so:

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- Experiential judgments need not be certain.
- Such a phenomenalist basis does not amount to Phenomenalism.

Adding Structuralism

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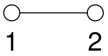

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- If the agent is assumed to be acquainted with the *individuals* in D_E, then one should opt for sets; if the agent is only acquainted with *higher-order* entities (e.g., relations $\Im(P)$), then one should opt for structures.

- There is a methodological benefit of the structuralist view if applied to *phenomenalist* substructures: they get more *inter-subjective* as the "material" of experience becomes irrelevant (see Carnap in the *Aufbau*).

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- The empirical substructures might still end up being *rigid* (as claimed by Carnap in the *Aufbau*); in the phenomenalist case, *temporal relations* of experiences might do the trick.

Final Heresies

- What if we took the ultimate step: use a phenomenalist structuralist basis, and *assume meaning is empirical content* (this can be made precise). What exactly would we win or lose?

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  Bad?

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It is unclear which properties, if any, these objects have *outside of the structure*. But it is at least not inconsistent to regard these objects as internal *appearances* of one and the same external “thing in itself”:

$$\exists x(x = t_1 \wedge x = t_2 \wedge x = t_3 \wedge \ldots \wedge \textit{in } S \textit{ it is the case that } (t_1 \neq t_2 \neq t_3 \neq \ldots))$$