

# Empirical Significance, Ramsey sentences, and the Theory of Definition —Summary—

Sebastian Lutz

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**Introduction.** In my talk, I will analyze the relations between a number of proposed criteria of significance, Ramsey sentences, and two conceptions of creativity from the theory of definition. These relations are close enough to suggest that empirical significance is a fruitful notion.

A reconsideration of empirical significance is in order because, first, a criterion is needed (see, for example, the discussions on creationism and string theory). Second, many criticisms of proposed criteria incorrectly assume that the criteria have to double as criteria of meaning or confirmation, or that the criteria's presumption of a bipartition of the vocabulary into observational and theoretical symbols has to be possible in natural language or independent of context. Third, criticisms and improvements have mostly focussed on Ayer's criterion and its successors, ignoring the criteria I will discuss.

In the following, all criteria presume a bipartition of the vocabulary  $\mathcal{V}$  into observational symbols  $\mathcal{O}$  and theoretical symbols  $\mathcal{T}$ . I will allow for a consistent set of analytic sentences  $\Pi_{\mathcal{V}}$  closed under entailment. A set of  $\mathcal{O}$ -sentences  $\Omega$  is possible iff  $\Omega \cup \Pi_{\mathcal{V}}$  is consistent, and an  $\mathcal{O}$ -structure  $\mathfrak{A}_{\mathcal{O}}$  is possible iff it can be expanded to a model of  $\Pi_{\mathcal{V}}$ , that is, there is a structure  $\mathfrak{B} \models \Pi_{\mathcal{V}}$  such that  $\mathfrak{B}|_{\mathcal{O}} = \mathfrak{A}_{\mathcal{O}}$ , where  $\mathfrak{B}|_{\mathcal{O}}$  is the reduct of  $\mathfrak{B}$  to  $\mathcal{O}$ . A set of sentences  $\Gamma$  analytically entails a sentence  $\alpha$  iff  $\Gamma \cup \Pi_{\mathcal{V}} \models \alpha$ . Finally, call a sentence  $\alpha$  falsified/verified/ $\mathcal{O}$ -determined by a possible  $\mathcal{O}$ -structure  $\mathfrak{A}_{\mathcal{O}}$  iff in all expansions of  $\mathfrak{A}_{\mathcal{O}}$  to models of  $\Pi_{\mathcal{V}}$ ,  $\alpha$  is false/is true/has the same truth value.

**Falsifiability.** The best known criterion of empirical significance is falsifiability. A sentence  $\alpha$  is falsifiable iff there is a possible set  $\Omega$  of  $\mathcal{O}$ -sentences such that  $\Omega \cup \Pi_{\mathcal{V}} \models \neg\alpha$ . This is equivalent to  $\alpha$  being syntactically  $\mathcal{O}$ -creative with respect to  $\Pi_{\mathcal{V}}$ . From the theory of definition, it is known that this criterion is strictly stronger than  $\alpha$  being semantically  $\mathcal{O}$ -creative with respect to  $\Pi_{\mathcal{V}}$ , which is the case iff not every possible  $\mathcal{O}$ -structure can be expanded to a model

of  $\alpha$ . A sentence is semantically  $\mathcal{O}$ -creative with respect to  $\Pi_{\mathcal{V}}$  iff it is semantically falsifiable, that is, it is falsified by at least one possible  $\mathcal{O}$ -structure.

Based on an ordinary language analysis, Lewis (1988) suggests that a sentence  $\alpha$  is about observation iff any two possible worlds that are identical with respect to observation assign the same truth value to  $\alpha$ . If  $\alpha$  is a sentence of predicate logic and the possible worlds are determined by the set of analytic sentences  $\Pi_{\mathcal{V}}$ , this means that  $\alpha$  is about observation iff for any two  $\mathfrak{A}, \mathfrak{B} \models \Pi_{\mathcal{V}}$  with  $\mathfrak{A}|_{\mathcal{O}} = \mathfrak{B}|_{\mathcal{O}}$ ,  $\mathfrak{A} \models \alpha$  iff  $\mathfrak{B} \models \alpha$ . Lewis defines the content of  $\alpha$  as the set of possible worlds that it excludes, that is, as  $E := \{\mathfrak{A} \mid \mathfrak{A} \models \Pi_{\mathcal{V}} \cup \{\neg\alpha\}\}$ . For Lewis, part of the content of  $\alpha$  is then about observation iff it has a subset  $F \subseteq E$  such that any two possible worlds that are identical with respect to observation are either both in  $F$  or both not in  $F$ . This criterion is trivial because  $F$  may be empty. Demanding that  $F$  be non-empty makes the criterion equivalent to semantic falsifiability.

Existentially quantifying over all  $\mathcal{T}$ -symbols of a sentence  $\alpha$  results in  $\alpha$ 's Ramsey sentence  $R(\alpha)$ . This has often been suggested as a description of the empirical content of  $\alpha$ , because all and only the  $\mathcal{O}$ -sentences that follow from  $\alpha$  also follow from its Ramsey sentence. This suggests that if  $\Pi_{\mathcal{V}}$  can be axiomatized by one sentence  $\pi$ , then  $\alpha$  has empirical content iff  $R(\pi) \not\models R(\pi \wedge \alpha)$ . This is again equivalent to semantic falsifiability.

**Strong  $\mathcal{O}$ -determinacy.** According to Przełęczki (1974), a sentence is strongly  $\mathcal{O}$ -determined iff it is determined by all possible  $\mathcal{O}$ -structures. This is the case iff  $\alpha$  is about observation according to Lewis. Przełęczki's criterion is a generalization of the criterion of meaningfulness in the theory of measurement (Roberts and Franke 1976), once the concept of a measure, defined as a relation between two structures, is captured within one single structure.

**Weak  $\mathcal{O}$ -determinacy.** According to Przełęczki (1974), a sentence is weakly  $\mathcal{O}$ -determined iff it is determined by at least one possible  $\mathcal{O}$ -structure. This is equivalent to  $\alpha$  being semantically falsifiable or verifiable, where  $\alpha$  is semantically verifiable iff it is verified by some possible  $\mathcal{O}$ -structure.

**Conclusion.** The classical criteria of empirical significance form a coherent whole and connect in a satisfying way with the theory of definition, the theory of measurement, the notion of empirical content as explicated by the Ramsey sentence, and the ordinary language notion analyzed by Lewis. This suggests that the criteria successfully explicate the underlying idea of “having a connection to observations”.

## References

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