Sektion 1: Logik und Wissenschaftstheorie

Assertion and *Denial* in Proof-Theoretic Semantics

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Proof-theoretic semantics is an attempt to define logical consequence and, more generally, analytic reasoning in terms of proof rather than truth. By its very nature – in emphasizing *proof* rather than *refutation* – it is assertion-driven. It defines what counts as a valid proof of an *assertion*, and even when it deals with *assumptions*, it considers them to be placeholders for valid proofs. Alternative versions of proof-theoretic semantics give the notion of an *assumption* a stronger stance, considering assumption inferences to be on the same level as assertion inferences. However, even then there remains an asymmetry between proofs and refutations or between assertions and denials. This is reflected by the fact that in such frameworks negation is defined indirectly by reduction to absurdity rather than by a notion in its own right.

Corresponding to ideas developed in extended logic programming, we propose a clausal logic of assertions and denials, in which clauses have the form

$$(\sim)A \Leftarrow (\sim)B_1,\ldots,(\sim)B_n$$

Here '~' is a rejection operator which indicates the denial of a proposition and which may only occur in outermost position, i.e. cannot be iterated. The parentheses indicate that the rejection operator may be either present or missing.

Dealing with generalized reasoning systems of this kind leads to novel *symmetry or harmony principles* which go beyond the well-known harmony principles for natural deduction or sequent systems. This is due to the fact that by means of dualization, given ('primary') *assertion* rules lead to associated ('secondary') *denial* rules and *vice versa*. We may now ask how secondary rules relate to primary ones laid down by definition, whether the primary rules comprise the secondary ones, etc. We investigate corresponding harmony principles and relate them to questions of nonmonotonicity and general questions of the foundations of proof-theoretic semantics. We also indicate how the idea of incorporating formal proofs and formal refutations in a *uniform system* can illuminate general questions of rationality, in particular concerning the role of foundational reasoning in constructivist epistemologies in comparison with Popper's refutation-based approach.