Facts as Proofs

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Attitude verbs like *glauben/believe*, *wissen/know*, *bedauern/regret* combine, in English as well as in German, with declarative complement clauses, which are generally assumed to refer to propositions. As is well-known *wissen/know* and *bedauern/regret* differ from *glauben/believe* with respect to factivity – the former but not the latter presuppose that the embedded proposition is true. Ginzburg & Sag (2000) claim, however, that factive verbs do not simply select for true propositions but instead select for facts, which they assume to be ontologically distinct from propositions. This raises two questions: (i) What is the evidence that there is an ontological category of facts distinct from propositions, and (ii) how do facts differ from (true) propositions?

In this paper I will adopt Ginzburg & Sag's 'Natural Language Metaphysics' point of view regarding linguistic data as the crucial criterion for ontological distinctions. I will moreover follow Ginzburg & Sag in arguing for the distinction of facts and propositions, although in a slightly different way. I will provide evidence for the fact / proposition distinction from the distribution of German *wissen* vs. *kennen* (both *know* in English), and I will propose to view facts as proofs in the sense of Martin-Löf's theory of types (cf. Martin-Löf 1987), which constitute truth-makers 'par excellence'.

Ginzburg & Sag's central argument in favor of a distinct category of facts is based on substitution. They consider nominal complements in addition to verbal complements and test the substitution of the nominal by it's complement. If a non-factive verb like *believe* is combined with a proposition-denoting nominal, e.g., *claim*, the substitution goes through, thus showing that *believe* selects for propositional arguments. If a factive verb like *know* is combined with a fact-denoting nominal, e.g., *fact*, the substitution also goes through, cf. (1a). But if a factive verb is combined with a proposition-denoting nominal, the substitution is blocked, cf. (1b). This is taken to show that factive verbs select for arguments denoting facts, but not for arguments denoting propositions.

(1a) It is a fact is that Hans doesn't have any money.
Marie (?) knows / is familiar with that fact.
==> Marie knows that Hans doesn't have any money.

(1b) There is the claim that Hans doesn't have any money.
Marie knows that claim.
=/=> Marie knows that Hans doesn't have any money.

Applying the substitution test to German data yields the problem that we have to switch from *wissen* to *kennen* to preserve grammaticality, cf. (2), which is the German counterpart of (1a). Surprisingly, the paradigm case of a factive verb – *wissen* – does not take the paradigmatic fact-denoting nominal – *Tatsache* – as an argument. This observation may cast doubt on Ginzburg & Sag's conclusions from the substitution test (note that in English the combination of *know* and *fact* seems to be marked, too.)

(2) Es ist eine Tatsache, dass Hans kein Geld hat.
Marie kennt /*weiß diese Tatsache.
==> Marie *kennt / weiß, dass Hans kein Geld hat.

German *wissen* und *kennen*[1] differ in that the former takes only complement clauses (with a few exceptions) and the latter only nominal arguments. Combined with *Tatsache*, as in (2), *kennen* relates to

[1] A similar distinction is found in Romance languages.

wissen as follows: *Marie weiß, dass φ* entails *Marie kennt die Tatsache, dass φ*. The meaning of *eine Tatsache kennen* might then be spelled out as being familiar with a truth-maker for *φ*, while *wissen* selects for the truth-bearer *φ* and comes with the presupposing that there is a truth-maker and that the agent is familiar with it. Taking facts to be truth-makers, *kennen* selects for facts (among other things) while *wissen* selects for true propositions.

In possible world semantics a proposition is regarded as the set of possible worlds where it is true. In type theory (cf. Martin-Löf 1987, Ranta 1994, Cooper 2005) a proposition is regarded as the set of proofs that it is true. Note that proofs are conceived of as objects instead of processes, and are part of the object language. They relate to a proposition just like an element relates to a set. The assertion that ***A*** is true thus entails that there is an element ***a*** which is a proof of ***A*** (i.e. ***a:A***). This suggests a simple and elegant distinction between facts and true propositions: a fact is a proof of a proposition whereas a true proposition is one that has a proof. The type theory conception of a proposition matches perfectly with the *wissen/kennen* difference shown above since it reflects the duality of truth-maker and truth-bearer. The meaning of *wissen* understood as justified true belief can thus be specified as in (3) (immune to the Gettier problem).

(3) Marie *weiß/knows* that φ iff (i) Marie believes that *φ*
(ii) there is a proof of *φ*
(iii) Marie *kennt* / *is familiar with* this proof of *φ*

Taking facts to be proofs in a type theoretic sense confirms Ginzburg & Sag's claim that facts are ontologically distinct from propositions. However, they turn out to be intimately connected since facts and true propositions always come in pairs: truth-maker plus truth-bearer. This is why we can easily switch between *wissen* and *die Tatsache kennen* such that the substitution in (1a)/(2) is licensed. Factive verbs like *bedauern*/ *regret* which combine with complement clauses as well as nominal arguments may be interpreted as being (mildly) ambiguous, either picking up a proposition (which has a proof, since it is presupposed to be true) or picking up the proof (when combined with *Tatsache/fact*). Substitution in (1b) on the other hand, is blocked because, as argued by Ginzburg & Sag, *claim* is proposition-denoting – *knowing a claim/ eine Behauptung kennen* does not entail that the agent knows a proof for this claim. This of course raises the question of what the meaning of *kennen* is when combined with other nominals, in particular ones that can also be combined with *wissen*, for example *Marie kennt/ weiß den Weg* (*Mary knows the way*).[2]

Proofs in type theory are similar to events in a Davidsonian event semantics in that both constitute truth-makers. But it is well-established that facts and events must not be conflated because the latter but not the former are spatio-temporally located. Proofs in type theory are also similar to situations. In Kratzer (2002) facts are defined as particular situations including only 'relevant' subsituations. Cooper (2005) points out that the *propositions-as-types* principle of Martin-Löf's type theory is very close to the Austinan notion of truth and we might regard the proof of a proposition as a situation supporting the corresponding infon. Cooper version of type theory augmented with records seems a promising representation format for spelling out the notion of fact suggested in this paper.

Cooper, Robin (2005) Austinian truth, attitudes and type theory. *Research on Language and Computation*, Vol. 3 (2005), pp. 333-362
Ginzburg, Jonathan & Ivan Sag (2000) Interrogative Investigations. CSLI Publications.
Kratzer, Angelika (2002) Facts: Particulars or Information Units? *Linguistics & Philosophy* 25, 655-670.
Martin-Löf, Per (1987) Truth of a proposition, evidence of a judgement, validity of a proof. *Synthese* 73, 407-420.
Ranta, Aarne (1994) Type-Theoretical Grammar, Clarendon Press, Oxford.

[2] Surprisingly, there seems to be no literature on *kennen* vs. *wissen* apart from German-for-foreigners text books.