Three Principles of Compositionality

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The subject matter of consideration touches the principle of compositionality in a formulation close to the following (T. Janssen 1997):
(C) *The meaning of the compound expression of language is a function of the meaning of its constituents and of the syntactic rules by means of which it is formed.*

Some historical remarks about this principle, its role in philosophy of language, and adherence to cognitive science will be given at the beginning. Three different aspects of compositionality, representing cognitively independent factors are taken into account in three different formulations of the principles. They are: syntactic, semantic, and pragmatic factors constituting language as a tool of communication.

Language is characterized as categorial, i.e. generated by a categorial grammar. Every compound expression of such a language has a functor-argument form and both it and its constituents (main functor and its arguments) have determined: 1) the *syntactic category* (*syntactic form*), 2) *intension* (*meaning, connotation*), 3) *extension* (*denotation*).

Considerations are formalized on the ground of the author's general formal-logical theory TCG of categorial syntax (1991) and categorial semantics (1998). Categorial language L can be treated as a partial algebra A_L with a carrier as the set of all *wfes* of language L, and functors as partial functions (operators) on this set. *Conceptual* (*intensional*) *model* of L and *semantic* (*referential, extensional*) model of L are partial algebras too; they correspond to A_L and are similar to A_L. They are given as homomorphic images of A_L determined by *intension* and, respectively, *extension* understood as functions defined on *wfes* of L. Such an approach is possible by adopting the following scheme of *compositionality* (C_h) for the function h representing:
1) *syntactic form*; 2) *intension*; 3) *extension*:

If $f(e_1,\ e_2, ...,\ e_n)$ is a functor-argument expression of L with main functor f and its arguments e_1, e_2,..., e_n, then

$$(C_h) \qquad h(f(e_1,\ e_2,\ \ldots,\ e_n)) \ = \ h(f)(h(e_1),\ h(e_2), ...,\ h(e_n)).$$

Within the author's theory can be formulated the syntactic notion of *truth* (corresponding to Tarski's T-scheme) and the semantic notion employing the notion of *meaning* (*intension*) and *denotation* (*extension*). By means of *compositionality* (C_h) the author gives some theorems of TCG (1999) of the adequacy of syntax with respect to semantics (both categorial and compositional) and refers to the *true value principle* (cf. W. Hodges 1996) proving:

Theorem 1 *Two expressions have the same interpretation (intension, resp. extension) iff replacing a constituent of one by a constituent of another in the sentence of L never alters the true value of the sentences.*

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