Montague Grammar: 50 years after

Thomas Ede Zimmermann
UCI, March 19th, 2018

1 Intensions

Priniciples of Frege-Carnap Semantics Frege (1892), Carnap (1947)

- The extensions of sentences and individual terms coincide with their (Fregean) referents.
- Compositionality can often be achieved by constructing ever more complex functional extensions to be applied to more basic extensions.
- Whenever extensions do not behave compositionally, they are substituted by corresponding intensions.

(1) $|\text{Mary is asleep}| = F(|\text{Mary}|,|\text{is asleep}|)$

(2) $\vdash$ Mary is asleep $\dashv = F(\text{m},|\text{is asleep}|)|$

(3) $|N \text{ is asleep}| = F(|N|,|\text{is asleep}|)$

(4) $|\text{is asleep}|(\text{x}) = \vdash$ x is asleep $\dashv$

(5) $|N \text{ is asleep}| = APP(|\text{is asleep}|,|N|)$
$=$ $|\text{is asleep}|(|N|)$
$=$ $\vdash N$ is asleep $\dashv$

(6) $|N|(|P|) = |P|(\text{x})$

(7) $[\![N \text{ is asleep }]\!]^{w,t} = APP([\![\text{ is asleep }]\!]^{w,t}, [\![N]\!]^{w,t})$
$=$ $[\![\text{ is asleep }]\!]^{w,t}([\![N]\!]^{w,t})$
$=$ $\vdash N$ is asleep in w at t $\dashv$

(8) $[\![N \text{ is asleep }]\!](w,t) = APP([\![\text{ is asleep }]\!](w,t), [\![N]\!](w,t))$

(9) a. Jones seeks a unicorn.
b. Jones seeks a horse such that it speaks.

(10) $[\![\text{seek a unicorn}]\!]^{w,t} = F([\![\text{seek}]\!]^{w,t}, [\![\text{a unicorn}]\!]^{w,t})$

(11) $[\![\text{seek a unicorn}]\!]^{w,t} = F([\![\text{seek}]\!]^{w,t}, [\![\text{a unicorn}]\!])$

(12) $[\![\text{seek a unicorn}]\!]^{w,t} = [\![\text{seek}]\!]^{w,t}([\![\text{a unicorn }]\!])$

Types Montague (1970b)

a) Starting with the basic types e and t, one may form new types by either pairing them (as before) – from given types a and b to a functional type ⟨a,b⟩ – or adding an s to them: from given types a to intensional type ⟨s,a⟩.

b) A more general system adds s as a third basic type (alongside e and t) and keeps the general rule that types are closed under pairs: from given types a and b to a functional type ⟨a,b⟩.

(13) John reports that Mary thinks that every member of the soccer team is red-headed. Bäuerle (1983)

(14) $[\![\text{think}]\!]^{w}(\{w' \mid [\![\text{every}]\!]^{w'}([\![\text{m.o.t.s.t.}]\!]^{w})([\![\text{red-headed}]\!]^{w'}) = 1\})(\text{m}) = 1$

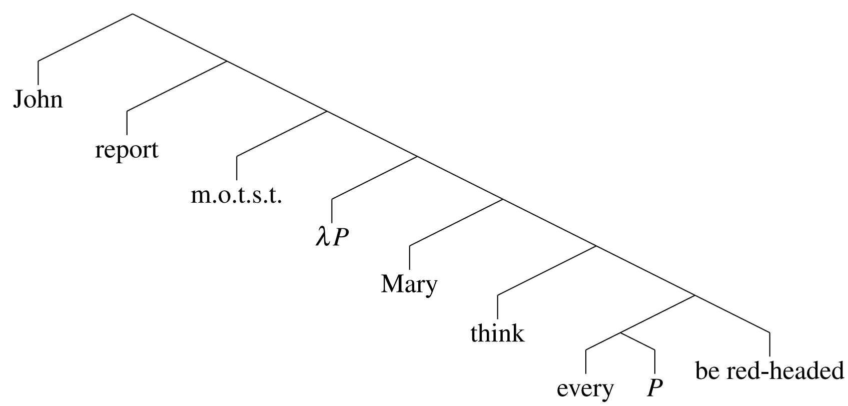
(15) a. $\{w' \mid [\![\text{every}]\!]^{w'}([\![\text{m.o.t.s.t.}]\!]^{w'})([\![\text{red-headed}]\!]^{w'}) = 1\}$
b. $\{w' \mid [\![\text{every}]\!]^{w'}([\![\text{m.o.t.s.t.}]\!]^{w})([\![\text{red-headed}]\!]^{w'}) = 1\}$

Strategies for overcoming Bäuerle's problem

i. Nouns and other constituents may be allowed to take intensional scope at LF. Groenendijk & Stokhof (1982)

ii. Compositional contributions to intensional environments may be obtained by locating them higher up in the hierarchy of intensions. Zimmermann (t.a.)

(16) a.



b.

|

$(13)|^{0}_{1}$

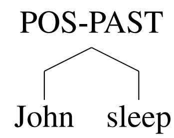
$\equiv$ $\mathbf{A}^0(\mathbf{A}^0(\mathbf{R})(\mathbf{A}^1(\mathbf{A}^1(^\wedge\mathbf{T})(\mathbf{A}^2(\mathbf{A}^2(^{\wedge^2}\mathbf{ALL})(^{\wedge^2_1\vee^2\wedge^2}\mathbf{M}))(^{\wedge^2}\mathbf{R})))(^\wedge\mathbf{m})))(\mathbf{j})$

$\equiv$ $report'_i(John', \lambda j.\ think'_j(Mary', \lambda k.\ m.o.t.s.t.'_j \subseteq red\text{-}headed'_k))$

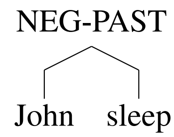
2 Types

(17) a. John slept.
 b. John didn't sleep

(18) a.

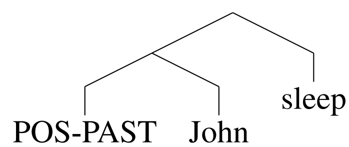


 b.

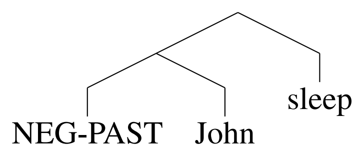


(19) a. $PST^{+}(\llbracket N \rrbracket)(\llbracket V \rrbracket)(w,t) = 1$
 $\equiv$ $\llbracket N \rrbracket^{w,t'}(\llbracket V \rrbracket^{w,t'}) = 1$, for some t' before t.
 b. $PST^{-}(\llbracket N \rrbracket)(\llbracket V \rrbracket)(w,t) = 1$
 $\equiv$ $\llbracket N \rrbracket^{w,t'}(\llbracket V \rrbracket^{w,t'}) = 0$, for all t' before t.

(20) a.

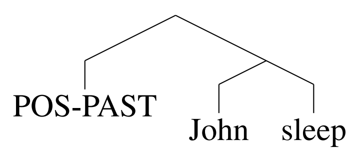


 b.

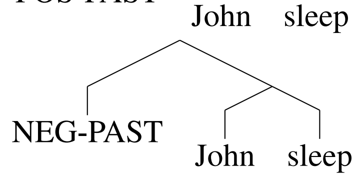


(21) a. $\llbracket \text{POS-PAST} \rrbracket^{w,t}(\llbracket N \rrbracket)(\llbracket V \rrbracket) = PST^{+}(\llbracket N \rrbracket)(\llbracket V \rrbracket)(w,t)$
 b. $\llbracket \text{NEG-PAST} \rrbracket^{w,t}(\llbracket N \rrbracket)(\llbracket V \rrbracket) = PST^{-}(\llbracket N \rrbracket)(\llbracket V \rrbracket)(w,t)$

(22) a.



 b.



(23) a. $\llbracket \text{POS-PAST} \rrbracket^{w,t}(\llbracket S \rrbracket) = 1$ iff $\llbracket S \rrbracket^{w,t'} = 1$, for some t' before t.
 b. $\llbracket \text{NEG-PAST} \rrbracket^{w,t}(\llbracket S \rrbracket) = 1$ iff $\llbracket S \rrbracket^{w,t'} = 0$, for any t' before t.

3 Models

(24) a. The president of the largest country is asleep.
 b. The author of the longest novel is awake.

Model-theoretic Semantics Montague (1970b); cf. Zimmermann (2011)

- More and more 'degenerate' models are eliminated.
- The Logical Spaces of the remaining 'realistic' models offer a wide variation of extensions (albeit within certain limits).

(12) $[\![\text{seek a unicorn}]\!]^{w,t} = [\![\text{seek}]\!]^{w,t}([\![\text{a unicorn}]\!])$

(2) $\vdash$ Mary is asleep $\dashv$ = F(m,|is asleep|)

(3) |N is asleep| = F(|N|,|is asleep|)

(4) |is asleep|(x) = $\vdash$ x is asleep $\dashv$

(25) Nobody is asleep.

(26) |Nobody is asleep| = F(|nobody|,|be asleep|)

(27) |nobody|(|is asleep|) = 1 iff |is asleep| = 0, for any person x.

References

Bäuerle, Rainer. 1983. Pragmatisch-semantische Aspekte der NP-Interpretation. In Manfred Faust, Roland Harweg, Werner Lehfeldt & Götz Wienold (eds.), *Allgemeine Sprachwissenschaft, Sprachtypologie und Textlinguistik*, 121–131. Tübingen: Narr.

Carnap, Rudolf. 1947. *Meaning and Necessity*. Chicago/London: University of Chicago Press.

Frege, Gottlob. 1892. Über Sinn und Bedeutung. *Zeitschrift für Philosophie und philosophische Kritik* NF 100. 25–50.

Groenendijk, Jeroen & Martin Stokhof. 1982. Semantic Analysis of *WH*-Complements. *Linguistics and Philosophy* 5. 175–233.

Montague, Richard. 1970a. English as a Formal Language. In Bruno Visentini (ed.), *Linguaggi nella società e nella tecnica*, 189–223. Milan: Edizioni di Comunitá.

Montague, Richard. 1970b. Universal Grammar. *Theoria* 36. 373–398.

Zimmermann, Thomas Ede. 2011. Model-theoretic Semantics. In Claudia Maienborn, Klaus von Heusinger & Paul Portner (eds.), *Semantics. An International Handbook of Natural Language Meaning*, vol. 1, 762–801. Berlin: DeGruyter.

Zimmermann, Thomas Ede. t.a. Fregean Compositionality. In Ball Derek & Brian Rabern (eds.), *The Science of Meaning*, Oxford: Oxford University Press.