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Meaning

Giosuè Baggio¹

¹Norwegian University of Science and Technology

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The meaning of an expression is the idea or message it communicates. For example, “tennis balls are yellow” communicates a fact about the color of tennis balls in virtue of the meaning of “yellow.” Language has often been the focus of theories of meaning, but it is not the exclusive object of study. Because expressions may be linguistic or nonlinguistic, meaning is a concern of any research on understanding and interpretation. Cognitive science offers complementary perspectives on meaning that, though broadly applicable, are most clearly articulated in the study of language.

History

A cluster of recurring questions has characterized research into meaning in the Western tradition ([Eco, 1984](#)). In antiquity, seminal works such as Plato’s *Cratylus* and Aristotle’s *On Interpretation* examined whether the relationship between words and their meaning is conventional (based on social agreement), how the human mind connects language to reality (a relation known as *reference*), how complex meanings are composed from simpler parts, and how grammar and logic provide structure to meaning. At least since late antiquity, reflections on language have been embedded into wider discussions of signs and signification. Medieval and modern theories viewed linguistic meaning as a product of human cognitive capacities, given the need to express different aspects of reality—objects, properties, relations—and the constraints of grammar and logic.

In the last century, two paradigms emerged. In the formal sciences, meaning has been described in terms of *functions* from expressions to sets, for example, from “yellow” to the set of yellow things, from “yellow ball” to the intersection of the sets of yellow things and balls, etc. Together, the function and the sets are called a *model* ([Tarski, 1944](#)). In this theory, known as *model-theoretic semantics* ([Montague, 1970](#)), meaning and truth are relative to a model: “Engines emit CO₂” is true in models where “engines” refers to fossil fuel motors and false in models where “engines” refers to electric motors. This approach has been applied to study key aspects of linguistic meaning ([Portner & Partee, 2008](#)).

In cognitive science, meaning has been viewed as the “holy grail” of the study of mind ([Jackendoff, 2002](#)), essential to understanding symbolic cognition and communication. Some authors consider meaning as *grounded* in concepts [see [Concepts](#)], perception, action, and other systems of the mind and brain ([Barsalou, 2008](#)). While controversial as a general theory of meaning, this approach has proved useful for analyzing certain linguistic phenomena. The metaphor “time is a thief” does not convey that time belongs to the set of thieves. It rather suggests that time shares certain characteristics with a thief, such as stealth and the removal of something valuable (e.g., youth or opportunity). This kind of meaning, which relies on relations between concepts rather than set membership ([Lakoff & Johnson, 1980](#)), is difficult to represent in standard model-theoretic semantics.

Core concepts

Meaning cannot be reduced to matching words to the world (many words do not refer to anything in the world), to what speakers intend to communicate (speaker intentions can differ from words' conventional meaning and from the interpretations at which hearers arrive), to information (in the sense of quantifiable content, which may vary when the same words are used in different contexts), or to usage patterns (meaning motivates use, not the other way around). More plausibly, some theories try to analyze meaning as sets of *primitives* (building blocks) and *operations* (rules of combination and interpretation) that would explain how simple and complex expressions are generated and understood.

Meaning primitives

Formal theories of meaning assume *types* and *sorts* as primitives, classifying entities, events, properties, and other aspects of reality ([Montague, 1970](#)), while others analyze concepts into finite sets of defining *features* (e.g., “boy = young + male + human”; [Katz & Fodor, 1963](#)). Other theories relate meanings to representational capacities of the mind, drawing on language-like systems of thought ([Fodor, 1975](#)) [see [The Language of Thought Hypothesis](#)] or on language-independent perceptual and cognitive dimensions, such as space, time, shape, and color ([Gärdenfors, 2004](#); [Jackendoff, 1983](#)). Theories based on primitives normally assume that these are finite (limited in number) and heterogeneous (diverse in kind) to account for the variety and open-endedness of expressible meanings.

Meaning operations

Semantic theories aim to explain how primitives combine to form complex meanings. The principle of compositionality states that the meaning of any complex expression depends on the meanings of its parts and how they are combined ([Janssen & Partee, 1997](#)) [see [Compositionality](#)]. Grammar and logic guide this combination. But not all meanings comply with compositionality. Some expressions integrate elements from two or more domains of experience: “This surgeon is a butcher” blends the aims of surgery with the manner of butchery to convey lack of skill and harm. Typical utterances communicate more than their compositional meaning: “I ate some of the bread” *implicates* (without saying) that I did not eat all of it; “the king of France is bald” *presupposes* (again without saying) that France has a king. Meaning-building operations must include rules of interpretation that allow users of a language to derive the most plausible meaning for a given utterance.

Questions, controversies, and new developments

Meaning in the mind and brain

Some aspects of word meaning depend on facts outside the mind: While “water” refers to H₂O also for speakers who ignore the chemical composition of water ([Putnam, 1973](#)), people’s actual use of “water” involves multiple factors beyond chemical composition, including the liquid’s source, location, and typical uses ([Malt, 1994](#)). All these aspects of meaning are ultimately learned and represented in the brain.

Experiments in cognitive neuroscience have revealed specific temporal windows for processing meaning ([Kutas & Federmeier, 2011](#)) and activity across brain networks that underpin the storage and on-line integration of information ([Lambon Ralph et al., 2017](#)). Meaning is encoded in the brain in multiple formats: as stable, long-term representations of word meanings and as flexible, short-term structures that connect those meanings to sentence roles and to what is being referred to in the current context ([Baggio, 2018](#)).

Meaning, embodiment, and interaction

Theories within 4E Cognition—embodied, embedded, extended, enactive—explore how meaning arises through interactions between language, body, environment, and other agents. Some embodied theories suggest that we understand language by mentally simulating meaning through sensory and motor systems ([Barsalou, 2008](#)). In theories of communication as action, such as game-theoretic semantics, meaning emerges as usage conventions through implicit coordination between senders and receivers of signals ([Lewis, 1969](#)) [see [Signaling](#)]. Alternatively, some theories claim that meaning is grounded in bodily experience and environmental interaction, rather than depending entirely on social conventions.

Meaning across languages and cultures

Languages and cultures can vary in how they express meaning. Anthropological and cross-linguistic studies show that concepts—such as space, time, kinship, emotions, colors, body parts—and meanings can be organized differently across languages or cultures ([Malt & Majid, 2013](#)). Research in linguistic anthropology examines how meaning is shaped by cognitive, social, and environmental factors. This diversity challenges the idea of a single universal human conceptual system and reveals the importance of cultural evolution in shaping systems of linguistic meaning.

Meaning and computation

The formal tradition assumes that meaning can be computed from grammatical or logical structure according to the principle of compositionality. However, real-world language understanding, as a capacity of the human mind, involves the derivation of meanings that are not fully constrained by grammar or logic, as in the examples above. Formal systems, such as those used in logic and model-theoretic semantics, have clear rules and limits, which may not capture the richness and nuance of meaning in context. In computer science and artificial intelligence (AI), an open question is how real-world meaning and understanding can be modeled, for example as emergent properties of statistical patterns learned by artificial neural networks ([McClelland & Rogers, 2003](#)).

Broader connections

Nonlinguistic meaning

Addressing meaning in language has required engaging with other formal systems, such as logic and set theory. The formal approach has been extended to sign language, gesture, music, dance, and visual art,

showing that expressions in these domains also exhibit systematic relationships to “the world” ([Schlenker, 2022](#))—not necessarily to sets of things, as in standard model-theoretic semantics, but possibly to emotions and other affective states, imagined scenarios, and agents’ perspectives. Language is but one manifestation of a human tendency to adopt a “semantic stance” and treat all sorts of natural and cultural objects—words, images, music, artifacts, etc.—as carriers of meaning. Research on meaning across domains, beyond language, suggests possible shared semantic structures and cognitive capacities, though the extent and nature of such commonalities remains debated.

Nonhuman meaning

Some theories suggest that meaning originates from organisms developing internal states to track patterns in their environment ([Millikan, 1984](#)). Animals may therefore have basic forms of meaning, as testified by primate gestures and calls that may “refer” to entities or events, and can combine into more complex gestures or calls with new meanings ([Seyfarth & Cheney, 2017](#)). Machines raise different questions. Some researchers ask whether and how AI could “crash the barrier of meaning” and achieve human-like understanding ([Mitchell, 2020](#)) [see [Large Language Models](#)]. AI systems can simulate understanding and intentional communication, but currently, their behavior and internal states are largely parasitic on human meaning. It remains an open question whether future AI systems could develop such capacities.

Further reading

- Gärdenfors, P. (2004). *Conceptual spaces: The geometry of thought*. MIT Press.
- Jackendoff, R. (2002). *Foundations of language*. Oxford University Press.
<https://doi.org/10.1093/acprof:oso/9780198270126.001.0001>
- Schlenker, P. (2022). *What it all means. Semantics for (almost) everything*. MIT Press.
<https://doi.org/10.7551/mitpress/12128.001.0001>

References

- Baggio, G. (2018). *Meaning in the brain*. MIT Press.
[↩](#)
- Barsalou, L. W. (2008). Grounded cognition. *Annual Review of Psychology*, 59(1), 617–645.
<https://doi.org/10.1146/annurev.psych.59.103006.093639>
[↩](#)
- Eco, U. (1984). *Semiotics and the philosophy of language*. Indiana University Press.
[↩](#)
- Fodor, J. A. (1975). *The language of thought*. Harvard University Press.
[↩](#)

[↩](#)

- Gärdenfors, P. (2004). *Conceptual spaces: The geometry of thought*. MIT Press.

↩

- Jackendoff, R. (1983). *Semantics and cognition*. MIT Press.

↩

- Jackendoff, R. (2002). *Foundations of language*. Oxford University Press.

<https://doi.org/10.1093/acprof:oso/9780198270126.001.0001>

↩

- Janssen, T. M., & Partee, B. H. (1997). Compositionality. In J. F. van Benthem & A. Ter Meulen (Eds.), *Handbook of logic and language* (pp. 417–473). Elsevier. <https://doi.org/10.1016/B978-044481714-3/50011-4>

↩

- Katz, J. J., & Fodor, J. A. (1963). The structure of a semantic theory. *Language*, 39(2), 170–210.

<https://doi.org/10.2307/411200>

↩

- Kutas, M., & Federmeier, K. D. (2011). Thirty years and counting: Finding meaning in the N400 component of the event-related brain potential (ERP). *Annual Review of Psychology*, 62(1), 621–647.

<https://doi.org/10.1146/annurev.psych.093008.131123>

↩

- Lakoff, G., & Johnson, M. (1980). *Metaphors we live by*. University of Chicago Press.

↩

- Lambon Ralph, M. A., Jefferies, E., Patterson, K., & Rogers, T. T. (2017). The neural and computational bases of semantic cognition. *Nature Reviews Neuroscience*, 18(1), 42–55.

<https://doi.org/10.1038/nrn.2016.150>

↩

- Lewis, D. (1969). *Convention: A philosophical study*. Wiley-Blackwell.

↩

- Malt, B. C. (1994). Water is not H₂O. *Cognitive Psychology*, 27(1), 41–70.

<https://doi.org/10.1006/cogp.1994.1011>

↩

- Malt, B. C., & Majid, A. (2013). How thought is mapped into words. *Wiley Interdisciplinary Reviews: Cognitive Science*, 4(6), 583–597. <https://doi.org/10.1002/wcs.1251>

↩

- McClelland, J. L., & Rogers, T. T. (2003). The parallel distributed processing approach to semantic cognition. *Nature Reviews Neuroscience*, 4(4), 310–322. <https://doi.org/10.1038/nrn1076>

↩

- Millikan, R. (1984). *Language, thought, and other biological categories*. MIT Press. <https://doi.org/10.7551/mitpress/4124.001.0001>

↩

- Mitchell, M. (2020). On crashing the barrier of meaning in artificial intelligence. *AI Magazine*, 41(2), 86–92. <https://doi.org/10.1609/aimag.v41i2.5259>

↩

- Montague, R. (1970), English as a formal language. In B. Visentini (Ed.), *Linguaggi nella Società e nella Tecnica* (pp. 189–224). Edizioni di Comunità.

↩

- Portner, P. H., & Partee, B. H. (Eds.). (2008). *Formal semantics: The essential readings*. Wiley.

↩

- Putnam, H. (1973). Meaning and reference. *The Journal of Philosophy*, 70(19), 699–711. <https://doi.org/10.2307/2025079>

↩

- Schlenker, P. (2022). *What it all means. Semantics for (almost) everything*. MIT Press. <https://doi.org/10.7551/mitpress/12128.001.0001>

↩

- Seyfarth, R. M., & Cheney, D. L. (2017). The origin of meaning in animal signals. *Animal Behaviour*, 124, 339–346. <https://doi.org/10.1016/j.anbehav.2016.05.020>

↩

- Tarski, A. (1944). The semantic conception of truth: And the foundations of semantics. *Philosophy and Phenomenological Research*, 4(3), 341–376. <https://doi.org/10.2307/2102968>

↩