The Relevance of Language for the Problem of Representation

Raffaela Giovagnoli

Abstract This chapter deals with the relationship between representation and language, which becomes more relevant if we do not intend the process of forming internal representations of reality but rather the representative function of language. Starting from some Fregean ideas, we present the notion of representation theorized by Searle. According to Searle, a belief is a "representation" (not in the sense of having an "idea") that has a propositional content and a psychological mode: the propositional content or intentional content determines a set of conditions of satisfaction under certain aspects and the psychological mode determines the direction of fit of the propositional content. We draw attention to some very interesting ideas proposed by Brandom in response to the challenge of Searle to AI, as they propose formal aspects of representation that rely on the use of ordinary language while avoiding the psychological order of explanation.

1 Introduction

The notion of "representation" has a medieval origin and indicates an "image" or "idea" that is similar to the object represented. Aquinas thinks that "to represent something is to include the similitude to a thing". The Scholastic thought introduces the interpretation of representation as the meaning of a word. Ockam distinguishes between three different meanings: (1) We intend with this term the mean to know something and this is the sense in which knowledge is representative and to represent means to be the entity by which something is known. (2) We intend representation as to know something through which we know something else; in this sense, the image represents the thing in the act of remembering. (3) We intend representing as causing knowledge, namely the way in which the object causes knowledge. Descartes and Leibniz have an original interpretation of the term to indicate the "picture" or "image" of the thing. Leibniz thinks that the monad is a

R. Giovagnoli (✉)
Faculty of Philosophy, Lateran University, Vatican City, Italy
e-mail: raffa.giovagnoli@tiscali.it

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representation of the universe. Wolf uses rather the Cartesian notion of *Vorstellung* as an image of the thing. Kant introduces a broader meaning of the term as the genus of all acts or manifestations of knowledge, which overcomes the traditional sense of image or similitude.

The notion of representation plays an important role in the problem of meaning. Medieval logic (Ispano, Ockam, Buridan and Albert of Saxony) distinguishes between meaning and *suppositio*: meaning is the representation or concept that we use for objective reference and the very objective reference is defined as *suppositio*. Aquinas follows this distinction while changing the terminology. He thinks that meaning and *suppositio* overlap in the use of singular terms but not in the general ones where meaning is their essence. Leibniz and Mill continue this tradition even though they introduce respectively the pairs: comprehension and extension, intension and extension; connotation and denotation.

The sense we use to represent the object is well interpreted in a logical sense by Frege. A sign that can be a name or a nexus of words or a single letter entails two distinguished things: the designed object or meaning (*Bedeutung*) and the sense (*Sinn*) that denotes the way in which the object is given to us. The absence of a psychological characteristic in Frege's philosophy of language is inherited by Carnap who maintains that to understand a linguistic expression means to grasp its sense and to investigate the state of affairs it refers to. The intentional meaning or sense can be applied to humans and robots. Church refers to Frege by distinguishing two dimensions of the use of a name: a name indicates its denotation and expresses its sense. The sense determines the denotation or it is a "concept" of the denotation. As we will see, pragmatism shares with formal semantics the view that we must overcome psychologism, but it shows original interpretations of the notion of representation, which has fruitful results for AI.

2 A Fregean Background

To start with a philosophical account of the use of language that matters for representing reality, I recall some ideas from Frege [1]. Frege inherits the Kantian conception according to which there could not be any combination of ideas unless there were already an original unity that made possible such a combination [2]. According to Sluga [3], Kant anticipates the Fregean doctrine of concepts: "Concepts, as predicates of possible judgments, relate to some representation of a not yet determined object". Thus the concept of body means something, for instance, metal, which can be known by means of the concept. It is therefore a concept solely by virtue of its comprehending other representations, by means of which it can relate to objects. It is therefore the predicate of a possible judgment, for instance, "every metal is a body". In the *Begriffsschrift* we can find an anticipation of the notion of judgment presented in the later work *Function and Concept*. The main point is that functions, concepts and relations are incomplete and require variables in their expression to indicate places of arguments. To establish a correspondence between

function and concept Frege maintains that the linguistic form of an equation or identity is an assertoric sentence. It embeds a thought as its sense or, more precisely, we can say that it "raises a claim" to have one. Generally speaking, the thought is true or false, namely it possesses a truth-value that could be considered as the meaning of the sentence, like the number 4 is the meaning of the expression "2 + 2" and London is the meaning of the expression "the capital of Britain".

The assertoric sentences can be decomposed into two parts: the "saturated" and the "unsaturated" one. For instance, in the sentence "Caesar conquered Gaul" the second part is unsaturated and it must be filled up with a proper name (in our case Caesar) to give the expression a complete sense. In *Concept and Object* Frege clearly describes the nature of the denotation of a predicate. A concept is the denotation of a predicate.

Searle's account presents a step beyond Frege's descriptivism because in order to give weight to propositions and their intentional contents we must distinguish them from the sense [4]. The sense of a referring expression is given by the descriptive general terms entailed by that expression but the Fregean notion of sense is often not sufficient to communicate a proposition. Consequently, it is the utterance of the expression "in a certain context" (namely a pragmatic context) that communicates a proposition. For example, the expression "the dog" has the descriptive content entailed by the simple term "dog"; this very content is not sufficient for a successful reference which also requires the communication or the possibility to communicate a uniquely existential proposition (or "fact", e.g. "There is one and only one dog barking on the right of the speaker and it is in the field of vision of both speaker and hearer"). The classical formalization ($\$x\ fx$) could be used to mean that "the predicate *f* has at least one instance" instead of "Some object is *f*'. The meaning of this option does not establish a correspondence between the original proposition and its revised existential formulation; rather it says that the circumstances in which one option is true are identical with the circumstances in which the other is true.

According to Searle, a belief is a "representation" (not in the sense of having an "idea") that has a propositional content and a psychological mode: the propositional content or intentional content determines a set of conditions of satisfaction under certain aspects and the psychological mode determines the direction of fit of the propositional content. "Conditions of satisfaction are those conditions which, as determined by the intentional, must obtain if the state must be satisfied" [5].

In this context, it is crucial to distinguish between the *content* of a belief (i.e. a proposition) and the *objects* of a belief (i.e. the ordinary objects). For instance, the content of the statement or belief that de Gaulle was French is the proposition that de Gaulle was French. The statement or belief is not directed at the proposition but is about de Gaulle. It represents him as being French by virtue of the fact that it has "propositional content" and "direction of fit".

The process of representation functions because of a Network of other intentional states and against a Background of practices and pre-Intentional assumptions that are neither themselves intentional states nor are they parts of the conditions of satisfaction of Intentional states [6]. The intentionality of mental states represents an

original interpretation of the Fregean account of beliefs. A further step in the analysis is the distinction between Intentionality-with-a-t and Intentionality-with-an-s. In this case a belief in Intentional-with-an-s does not permit us to determine its extension, i.e. substitution *salva veritate*. For instance, if I say "Vic believes that Rossella is an Irish setter" I simply report Vic's belief but I cannot commit myself to its truth, namely the fact that Rossella is an Irish setter. Obviously, Vic's belief is extensional and Vic is committed to its truth (it is intentional-with-a-t).

Let's now briefly refer to a difference between Frege's and Searle's accounts of belief. Standardly, beliefs are introduced by a "that" clause as in our example (1) "Vic believes that Rossella is an Irish setter". This report is different from the statement (2) "Rossella is an Irish setter": (1) is intensional whether or not (2) is extensional. A fundamental difference between the two forms of sentence is that in a serious literal utterance (2) is asserted, while in a serious literal utterance of (1) the proposition is not asserted.

Searle sets up conditions for the adequacy of intensional reports of intentional states [7]:

1. The analysis should be consistent with the fact that the meanings of the shared words in pairs such as (1) and (2) are the same, and in serious literal utterances of each they are used with these same meanings.
2. It should account for the fact that in (1) the embedded sentence does not have the logical properties it has in (2), viz., (2) is extensional, (1) is intensional.
3. It should be consistent with the fact that it is part of the meanings of (1) and (2) that, in serious literal utterances of (1), the proposition that Rossella is an Irish setter is not asserted, whereas in (2) it is.
4. The analysis should account for other sorts of sentences containing "that" clauses, including those where some or all of the logical properties are preserved, such as "It is a fact that Rossella is an Irish setter".
5. The analysis should apply to other sorts of reports of intentional states and speech acts which do not employ "that" clauses embedding a stance but use infinitives, interrogative pronouns, the subjunctive, change of tense, etc. Furthermore the analysis should work not just for English but for any language containing reports of intentional states and speech acts (as for example "Tess wants Rossella be an Irish setter").

The first condition could not be accepted from a Fregean perspective because, according to Searle, when we have sentences containing "that" clauses we have always the same meanings of the shared words and a variation of the illocutive act ("to believe that", "to say that", etc.). Nevertheless, Searle's account respects Frege's notion of belief. In the case of "to believe that…" sentences do not have the so-called "direct Bedeutung" but they have "indirect Bedeutung". This fact means that the truth-value can be assigned only to the second thought, i.e. the thought of the subordinate sentence.

The background as Searle describes it and the very notion of intentionality of beliefs have no normativity in establishing whether an individual belief is "true" in a strong sense, as something that can be shared by different people. According to this thesis, our second claim is that common beliefs as true beliefs are possible only in an intersubjective context in which individual descriptions can overlap by referring to the same object under precise substitutional rules.

According to Frege, the same object or *Bedeutung* can be thought of in different ways, namely the same object can have different "senses". Frege's famous example of the proper names or descriptions such as "Venus", "Morning Star" and "Evening Star" is however to be considered as valid for the explanation of common beliefs as "true" beliefs. For instance, A thinks Venus is the Morning Star and B thinks Venus is the Evening Star with the resulting communication problem; the problem is solved because the two descriptions have the same meaning, i.e. Venus, and surely it is possible to establish whether the two descriptions work for the object to which they refer.

Thoughts can be true or false but sentences do not express them "randomly". Sentences express thoughts as related to contexts of use in which they acquire their truth-value, i.e. they are true or false. For instance the sentence "That is a funny play" can be true or false depending on the context of use. We can grasp thoughts but Frege does not present an analysis of the "grasping" because he thinks that this implies a psychological order of explanation. Searle rather gives an account of the grasping through his brilliant account of the functioning of background based on intentionality. We can therefore show the complementarity between the description of the functioning of the cognitive grasping of the content of beliefs and the "normative" objective content that represents the ground of shared beliefs.

3 An Interpretation of Concepts Beyond Cognitive Science

There is a different interpretation of the Fregean semantics, which is bound to the concept's use in ordinary language along the lines of Davidson, Dummett and Sellars [8]. This theoretical option cannot be discussed in the ambit of cognitive sciences (in particular cognitive psychology, developmental psychology, animal psychology and artificial intelligence) because [9]:

Each of these disciplines is in its own way concerned with how the trick of cognition is or might be done. Philosophers are concerned with what counts as doing it—with what understanding, particularly discursive, conceptual understanding consists in, rather than how creatures with a particular contingent constitution, history, and armamentarium of basic abilities come to exhibit it. I think Frege taught us three fundamental lessons about the structure of concepts, and hence about all possible abilities that deserve to count as concept-using abilities. The conclusion we should draw from his discoveries is that concept-use is intrinsically stratified. It exhibits at least four basic layers, with each capacity to deploy

concepts in a more sophisticated sense of "concept" presupposing the capacities to use concepts in all of the more primitive senses. The three lessons that generate the structural hierarchy oblige us to distinguish between:

I. *concepts that only label and concepts that describe,*
II. *the content of concepts and the force of applying them, and*
III. *concepts expressible already by simple predicates and concepts expressible only by complex predicates.*

AI researchers and cognitive, developmental and animal psychologists need to take account of the different grades of conceptual content made visible by these distinctions, both in order to be clear about the topic they are investigating (if they are to tell us how the trick is done, they must be clear about exactly which trick it is) and because the empirical and in-principle possibilities are constrained by the way the abilities to deploy concepts in these various senses structurally presuppose the others that appear earlier in the sequence.

Concepts are acquired through the use of language and provide the classification of reality, i.e. shared knowledge. Classification is the traditional goal of classical philosophy, and starting from Ancient Philosophy it seems to be investigated beyond the mere exercise of reliable responsive dispositions to respond to environmental stimuli, even though we find very fruitful investigations in the natural sciences [9]. But, the conceptual classification is better explained by intending the application of a concept to something as *describing* it. One thing is to apply a label to objects, another is to describe them. In Sellar's words [10]:

It is only because the expressions in terms of which we describe objects, even such basic expressions as words for perceptible characteristics of molar objects, locate these objects in a space of implications, that they describe at all, rather than merely label.

Moving from the Fregean difference between judgeable content and judgment we considered above, we can isolate the semantic content of the descriptive concept (the ones that do not label) from the act of describing or the pragmatic force of describing by applying those concepts. In the case of compound sentences formed by the use of conditionals there are differences between, for instance, denial (as a kind of speech act) and negation (a kind of content). So, one thing is to say "I believe that labeling is not describing" and another is to say "If I believe that labeling is not describing, then labeling is not describing". In the first case, I am denying something, in the second not. The endorsement of judgeable content is the capacity to endorse conditionals, i.e. to explore the descriptive content of proposition, their inferential circumstances and consequence of application, which characterize a sort of "semantic self-consciousness". The higher capacity to form conditionals makes possible a new sort of hypothetical thought that seems to appear as the most relevant feature of human rationality because chimps or African grey parrots or other non-human animals just use concepts to describe things but are not able to discriminate the contents of those concepts from the force of applying them.

Complex concepts can be thought of as formed by a four-stage process [11]:

- First, put together simple predicates and singular terms, to form a set of sentences, say (Rab, Sbc, Tacd).
- Then apply sentential compounding operators to form more complex sentences, say (Rab → Sxc, Sbc&Tacd).
- Then substitute variables for some of the singular terms (individual constants), to form complex predicates, say (Rax → Sxy, Sxy&Tayz).
- Finally, apply quantifiers to bind some of these variables, to form new complex predicates, for instance the one-place predicates (in y and z) {∃x[Rax → Sxy], ∀x∃y[Sxy&Tayz]}.

The process is repeatable to form new sentences from the complex predicates playing the role that simple predicates played at the first stage like, for instance {∃x [Rax → Sxd], ∀x∃y[Sxy{&Taya}.

One fundamental difference to explain the role of conditionals for human logic is between "ingredient" content and "free-standing" content. The former belong to a previous stage in which it becomes explicit only through the force of sentence (query, denial, command, etc., that are invested in the *same* content). The latter is to be understood in terms of the contribution it makes to the content of compound judgments in which it occurs, consequently only indirectly to the force of endorsing that content. The process of human logical self-consciousness develops in three steps:

1. We are able to "rationally" classify through inferences, i.e. classifications provide reasons for others.
2. We form synthetic logical concepts formed by compounding operators, paradigmatically conditionals and negation.
3. We form *analytical* concepts, namely, sentential compounds are *decomposed* by noting invariants under substitution.

The third step gives rise to the "meta-concept" of ingredient content, i.e. we realize that two sentences that have the same pragmatic potential as free-standing, force-bearing rational classifications can nonetheless make different contributions to the content (and hence force) of compound sentences in which they occur as unendorsed components. It happens when [12]:

we notice that substituting one for the other may change the free-standing significance of asserting the compound sentence containing them. To form complex concepts, we must apply the same methodology to sub-sentential expressions, paradigmatically singular terms, that have multiple occurrences in those same logically compound sentences. Systematically assimilating sentences into various equivalence classes accordingly as they can be regarded as substitutional variants of one another is a distinctive kind of analysis of those compound sentences, as involving the application of concepts that were not components out of which they were originally constructed. Concepts formed by this sort of analysis are substantially and in principle more expressively powerful than those available at earlier stages in the hierarchy of conceptual complexity. (They are, for instance, indispensable for even the simplest mathematics.)

4 Analytic Pragmatism and the Problem of Representation

Making It Explicit aims at describing the social structure of the game of giving and asking for reasons, which is typical of human beings. *Between Saying and Doing* has a different task: it pursues the pragmatic end to describe the functioning of autonomous discursive practices (ADPs) and the use of vocabularies [13]. ADPs start from basic practices that give rise to different vocabularies and the analysis is extended to nonhuman intelligence.

The so-called "analytic pragmatism" (AP) represents a view that clarifies what abilities can be computationally implemented and what are typical of human reasoning [14]. First, Brandom criticizes the interpretation of the Turing Test given by strong artificial intelligence or GOFAI, but he accepts the challenge to show what abilities can be artificially elaborated to give rise to an autonomous discursive practice (ADP). What is interesting to me is that AI-functionalism or "pragmatic AI" simply maintains that there exist primitive abilities that can be algorithmically elaborated and that are not themselves already "discursive" abilities. There are basic abilities that can be elaborated into the ability to engage and ADP. But these abilities need not be discovered only if something engages in any ADP, namely they are sufficient to engage in any ADP but not necessary. Brandom's view could be seen as a philosophical contribution to the discussion about how to revisit some classical questions: the role of symbols in thought, the question of whether thinking is just a manipulation of symbols and the problem of isomorphism as sufficient to establish genuine semantic contentfulness.

The strategy of AP is based on a "substantive" decomposition that is represented in algorithms. Any practice-or-ability P can be decomposed (pragmatically analyzed) into a set of primitive practices-or-abilities such that:

1. they are PP-sufficient for P, in the sense that P can be algorithmically elaborated from them (that is, that *all* you need in principle to be able to engage in or exercise P is to be able to engage in those abilities plus the algorithmic elaborative abilities, when these are all integrated as specified by some algorithm); and
2. one could have the capacity to engage or exercise *each* of those primitive practices-or-abilities without having the capacity to engage in or exercise the target practice-or-ability P.

For instance, the capacity to do long division is "substantively" algorithmically decomposable into the primitive capacities to do multiplication and subtraction. Namely, we can learn how to do multiplication and subtraction without yet having learned division. On the contrary, the capacities to differentially respond to colours or to wiggle the index finger "probably" are not algorithmically decomposable into more basic capacities because these are not things we do *by* doing something else. We can call them *reliable differential capacities to respond to environmental stimuli* but these capacities are common to humans, parrots and thermostats.

Along the line introduced by Sellars, we can intend ADP typical of human practices in an "inferential" sense and strictly correlated with capacities to deploy an autonomous vocabulary (namely a vocabulary typical of human social practices) [15]. They are grounded in the notion of "counterfactual robustness" that is bound to the so-called "frame problem". It is a cognitive skill, namely the capacity to "ignore" factors that are not relevant for fruitful inferences. The problem for AI is not *how* to ignore but *what* to ignore. Basic practices that provide the very possibility to talk involve the capacity to attend to complex relational properties lying within the range of counterfactual robustness of various inferences.

It is very interesting to see the new version of intentionality as a pragmatically mediated relation which departs from a specific account of human discursive practices while showing the connection between modal and normative vocabularies: normative vocabulary essentially addresses acts of committing oneself, and modal vocabulary essentially addresses the contents one thereby commits oneself to. We can consider the following example. Imagine a non-autonomous vocabulary focused on the use of the term "acid". In this make-believe instance, if a liquid tastes sour one is committed and entitled to apply the term "acid*" to it. And if one is committed to calling something "acid*", then one is committed to its turning phenolphthalein blue. In this community there is agreement, under concurrent stimulation, about what things are sour and what things are blue and it has experts certifying some vials as containing phenolphthalein. Moving from this background, the community implicitly endorses the propriety of the material inference from a liquid's tasting sour to its turning phenolphthalein blue. If a practitioner comes across a kind of liquid that tastes sour but turns phenolphthalein red, he "experiences" materially incompatible commitments. To repair the incompatibility he is obliged either to relinquish the claim that the liquid tastes sour, or to revise his concept of an acid* so that it no longer mediates the inference that caused the problem. In this case, he can restrict its applicability to clear liquids that taste sour, or restrict the consequence to turning phenolphthalein blue when the liquid is heated to its boiling point. This move clearly shows how difficult it is to undertake new commitments since the practitioner may discover that he is not entitled to them. The lesson we learn from this example is that the world can alter the "normal" circumstances and consequences of application embedded in our concepts. The concept acid* entails that it is not *necessary* that sour liquids turn phenolphthalein blue but is *possible* that a liquid both be sour and turn phenolphthalein red.

I would like to point out that we meet an interesting reformulation of the classical Kantian notion of representation of objects. The transcendental apperception is replaced by a kind of synthesis based on incompatibility relations [16]:

In drawing inferences and "repelling" incompatibilities, one is taking oneself to stand in representational relations to objects that one is talking about. A commitment to A's being a dog does not entail a commitment to B's being a mammal. But it does entail a commitment to A's being a mammal. Drawing the inference from a dog-judgment to a mammal-judgment is taking it that the two judgements represent one and the same object. Again, the judgment that A is a dog is not incompatible with the judgment that B is a fox. It is incompatible with the judgment that A is a fox.

Taking a dog-judgment to be incompatible with a fox-judgement is taking the to refer or represent an object, the one object to which incompatible properties are being attributed by the two claims.

5 Conclusion

Starting from Frege's inheritance we can offer a history of concept's formation and use, which shows the peculiarity of human cognition. Differences among human, non-human animals and machines arise only if we consider corresponding differences and relations among fundamentally different kinds of concepts. A serious theoretical consideration is exemplified by the four-membered Chomsky hierarchy that describes kinds of grammar, automaton, and syntactic complexity of languages in an array from the most basic (finite state automata computing regular languages specifiable by the simplest sort of grammatical rules) to the most sophisticated (two stack pushdown automata computing recursively enumerable language specifiable unrestricted grammatical rules).

I think that we can observe the contribution that the philosophical analysis brings to the clarification of conceptual hence "representational" human activity. And this task means to consider all the grades of it from the simpler and less articulated sorts to the more complex and sophisticated kinds of concepts. Following the lesson of Analytic Pragmatism, we can enrich the research in the field of the phylogenetic development of sapience especially because we do not know about a corresponding process in non-human creatures. In a different way, Searle describes the use of ordinary language in all its dimensions in order to enrich mere empirical research. Here some interesting questions to which Brandom draws our attention: Human children clearly cross that boundary, but when, and by what means? Can non-human primates learn to use conditionals? Has anyone ever tried to teach them?

Another problem is addressed to AI, proposing very interesting varieties of possible implementation of sentential compounding like connectionism and parallel distributed processing systems. The problem is to capture the full range of concepts expressed by complex predicates as they lack the syntactically compositional explicit symbolic representations. As we have seen, it moves from the substitutional decomposition of such explicit symbolic representations.

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