

# The Social-Interactive Ontology of Language

Mark H. Bickhard  
*Department of Philosophy*  
*Lehigh University*

Language is almost universally considered an encoding of mental contents into an utterance stream, and mental contents, in turn, are almost universally considered constituted as, or derived from, encodings of the environment. This basic framework has been in place for millennia, but it has remained mysterious and perplexing how it could be modeled. I have argued for some time that both aspects of this encoding framework are fatally flawed, and here I outline an alternative perspective on the nature of both mental representation and language. The model outlined is generally pragmatist in the senses of Peirce (although it is not semiotic) and Dewey. It is an interaction-based model in which representation is emergent in interaction systems and language is constituted as a conventional system for generating interactions with social realities—which, in turn, are constituted as relations among individuals' representations of their environments.

In this article I outline a model of the ontology of language. I have argued for the claim that the metaphysics and epistemology that frame dominant approaches to language are flawed, incoherent in fact. If so, then an alternative metaphysics and epistemology are required in order to make sense of cognition and language.

This model is based on an alternative metaphysics that avoids the problems inherent in standard approaches. It yields a threefold social ontology of language based on an interactive, anticipatory model of representation.<sup>1</sup>

---

<sup>1</sup>Interaction is meant as interaction of an organism with its environment, which may or may not include (an)other agent(s).

Correspondence should be addressed to Mark H. Bickhard, Department of Philosophy, 15 University Drive, Lehigh University, Bethlehem, PA 18015. E-mail: [mhb0@lehigh.edu](mailto:mhb0@lehigh.edu)

The fundamental metaphysical framework is a process metaphysics, which, I argue, yields the possibility of genuine metaphysical emergence. I do not address the details of this framework here (see, e.g., Bickhard, 2009)—the focus here is on cognition and language.

I begin with a critique of standard encodingist models of representation. Then, in developing the interactivist alternative, I consider that complex agents must select actions to engage in from among indications of what interactions are possible in the current situation. Such indications can be true or false and thus constitute possible grounds for representation more generally—a point that I argue for and elaborate.

Given such a model of representation, a special kind of problem emerges when two or more complex agents are in each other's presence. This problem requires a coordinative solution of a kind that I dub a *situation convention*.

Finally, situation conventions constitute the locus of interaction for utterances. They are the “object” of interaction for language.

## COGNITION AND REPRESENTATION

### Encodingism

In standard frameworks, representation is constituted as some sort of special correspondence between representation and represented, a correspondence that encodes the represented. Multiple versions of this basic idea have been proposed: the special correspondence might be causal, informational, nomological, structural, of evolutionary origin, and so on. Representative current literature presents a number of variations on the basic encoding theme, such as Fodor (1978, 1987, 1990, 2003), Dretske (1988), Millikan (1984, 1993), Cummins (1996), the symbol system hypothesis (Newell, 1980; Newell & Simon, 1975/1987a, 1987b), (semantic) information processing (Bermudez, 2010), and so on (Bickhard, 1993, 2009, 2014; Bickhard & Terveen, 1995).

There is, however, a large family of problems with these approaches with some of ancient provenance and others being discovered recently. I argue that these problems are insoluble within this encoding framework—they are *created* by the framework.

One central problem in this family is the impossibility of accounting for organism-detectable error. Without organism-detectable error, there could be no error-guided behavior and no learning. The depth of this problem is indicated by its equivalence to the radical skeptical argument (which has been around awhile, unresolved and unresolvable within an encodingist framework).

The basic skeptical argument is that, in order to determine whether our representations are true or false, we would have to step outside of ourselves to

compare what we are actually representing—what’s on the other end of the representational correspondence—with our representation of it. We cannot step outside of ourselves, and so we cannot determine whether our representations are correct or not. Note that this general form of argument applies to all animals and to all variations on the theme of an encoding constituting correspondence.

### Interactivist Representation

I introduce the interactivist model of representation from a macroevolutionary perspective. In the (macro)evolution of complex agents, a fundamental problem emerged: how to select among alternative potential interactions. As agents become more complex, so also does this problem. Complex agents must have some functional indications of what their interaction possibilities are, functional indications of what they could do.<sup>2</sup>

A frog, for example, might have the possibility of flicking its tongue in one direction in order to eat a fly, another direction for a different fly, and still another direction for the possibility of catching a worm. Both the function of indication and the processes of selection among the indicated possibilities are of crucial importance; here I focus primarily on the indicative function.<sup>3</sup>

The fundamental point for current purposes is that such indications have truth value: they can be correct, and the interaction proceeds as indicated, or incorrect, and the interaction (if engaged) deviates from what is anticipated. This is the basic emergence of the normative property of truth-valued representation.<sup>4</sup>

Note that engaging in an indicated interaction and discovering that it does *not* proceed as anticipated detects that the indication, the anticipation, was false, whereas if the interaction proceeds as indicated, then the anticipation was true. Representation is future oriented—anticipatory—and this yields a way to transcend the radical skeptical argument. Encodingist models are intrinsically

---

<sup>2</sup>There is a philosophical background to these points that I do not address here. It has to do with accounting for genuine emergence, especially the emergence of *normative* phenomena. See, for example, Bickhard (2009).

<sup>3</sup>See Bickhard (2003). For discussion of how these functions might be realized in actual brains, see Bickhard (2015, in press-a, in press-b).

<sup>4</sup>Note that the interaction deviates from anticipation *if* the anticipation is false. The claim is not that being false is *constituted* in such a deviation of actual interaction: indications of interactive potentiality can be false as indications even if they are never attempted and, thus, that falseness—that deviation—never encountered. The claim is that anticipations constitute representation in virtue of bearing (emergent) truth value, not in being encoded pictures or being in informational semantic encoding relationships with something. The point here is that truth-valued phenomena intrinsically emerge in complex agents, whether or not they are called representational. In virtue of their realizing truth values, I do call them representational.

past oriented—spectator models, attempting to look backward down the input stream, in the words of Dewey (Dewey, 1929/1960; Tiles, 1990).<sup>5</sup> It is this future orientation that permits organism-detectable error: see if the future proceeds as anticipated.<sup>6</sup>

*Differentiations and encodings.* Here I point out a distinction between how interactive representation functions and how presumed encodings function. Interactions with an environment can yield differing internal outcomes depending on the environment being interacted with. In this manner, internal outcomes generate differentiations of types of environments that the agent is in: one type of environment yields *this* internal outcome, and another type yields this other internal outcome. This differentiation is the function of *contact*.

On the basis of such differentiations, indications of further interaction possibilities can be constructed: if a frog has a particular internal outcome of a visual interaction, it can set up an indication of the possibility of flicking its tongue in a certain way and eating. It is such indications of further possibilities that can have truth value and thereby bear *content* (see Bickhard, 2009, for further discussion).<sup>7</sup>

If there are no outputs in such a differentiating process—there is no *interaction*, only the reception of inputs—then we have strict input processing. In the perceptual system, such “passive” differentiations are assumed to encode whatever it is that they have differentiated, thus conflating contact with content. The same kinds of differentiation processes are required in the interactive model

<sup>5</sup>The interactivist model shares a number of assumptions with the pragmatism of Peirce, Dewey, and related thinkers (e.g., Piaget): there is a background process metaphysics (although not the same metaphysics as e.g., Peirce); the study of psychological phenomena has an action focus, not a passive visual perception metaphor (Joas, 1993); spectator models of perception are understood to be refuted (Dewey, 1929/1960); and so on. There are also, however, differences: representation is not taken to be fundamentally semiotic (although see Rosenthal, 1983) or truth as constituted in warranted assertability (Dewey, 1929/1960; Tiles, 1990).

<sup>6</sup>Indications or anticipations of possible interactions do not look much like standard forms of representation. What about objects, for example? Or what about representations of abstractions, such as the number three? These are much more sophisticated and complex kinds of representation, more so than the frog’s. The model nevertheless has the resources to be able to address such more complex representations, roughly borrowing from another pragmatist model, that of Jean Piaget (1954). I leave this part of the model aside for current purposes (see, e.g., Bickhard, 2009).

<sup>7</sup>There is a partial parallel here between contact and content on the one hand and Gibson’s perceptual interactions and the affordances that are thereby “picked up” on the other, but there are also differences. For example, content as interactive anticipations can form complex conditionalized webs of possible interactions (conditionalized in the sense that, if I engage in *this* interaction, then I can engage in *that* interaction)—webs that I call situation knowledge (see the following text). Such internal organization and possible mutual influence does not fit well with Gibson’s notion of affordance (Bickhard & Richie, 1983). However, there is an additional important possible parallel in that picking up an affordance could be false—perhaps that surface *doesn’t* afford walking after all.

for environmental contact, but they are not assumed to be themselves capable of truth value—they do not themselves constitute representation.

### Situation Knowledge

As illustrated by the case of the frog, indications of potential interactions can branch (e.g., multiple flies and/or worms). They can also iterate, in the sense that one possible action might bring into direct possibility some other action: if the frog shifts to the left, some additional worm might then be in range. Such branching and iterating indications of interaction possibilities can, in principle, generate vast webs of indications, and do so in higher animals.<sup>8</sup>

These webs constitute the agent's knowledge of what it could do, what it could do (or might be able to do) if some other flow of interacting took place first, and so on. It constitutes the agent's (interactive) knowledge of its situation—its *situation knowledge*.<sup>9</sup>

### Apperception

An agent's situation is always changing, and so also is its situation knowledge. Changes occur from interactions, activities of other entities, and the temporal flow of environmental processes. *Apperception* is the ongoing process of maintaining and updating situation knowledge. If I leave a toy block in this room, for example, I can (sometimes) return and play with it again. Apperception keeps track of such possibilities.<sup>10</sup>

### The Special Problem With Other Agents

If there is another agent in my presence, a special kind of problem arises for the apperceptive construction of situation knowledge. My characterization of the situation depends on my characterization of the agent. But the other agent's interactive potentialities for me depend in part on that agent's characterization of me.

This problem is mutual and reciprocal. We each need a characterization of interactive potentialities of the other, including their characterizations of oneself, in order to be able to characterize the situation in general. We each have an interest in resolving this apparent regress, and there many possible resolutions of

---

<sup>8</sup>It is special kinds of organizations within such webs that constitute some crucial kinds of representations, such as of small objects (Bickhard, 2009).

<sup>9</sup>Note that situation knowledge is constituted as indicative relationships among differentiating interaction possibilities, not among encoding correspondences.

<sup>10</sup>Apperception is not necessarily algorithmic. It can involve variation and selection problem solving for aspects of situations that are unclear.

such problems of mutually compatible characterizations—we could walk past each other on the right, or meet at a particular restaurant, or resolve a pronoun in compatible ways, and so on. In this sense, situations involving multiple agents generate a *coordination problem* in the sense of Schelling (1963).

### Situation Conventions

Solutions to coordination problems constitute *conventions* (Lewis, 1969).<sup>11</sup> These are conventions about the nature of the social situation—thus, *situation conventions*. Situation conventions are special kinds of relations among participants' situation knowledge—relations of interactive coordinative compatibility.<sup>12</sup>

Some situation conventions may never be repeated, such as the momentary state of mutual understanding in a (successful) ongoing conversation. Others, however, can extend over populations and times, such as driving on the right side of the road. These are *institutionalized conventions*.

Situation conventions, thus, are properties of the relationships among the situation knowledges of the participants. The existence of a situation convention is a factual matter: such coordinative relationships either hold or do not.<sup>13</sup> Conventions, then, exist as relational properties—properties of Schelling-style coordinative relations.<sup>14</sup>

---

<sup>11</sup>In a broadened sense of Lewis's (1969) model (Bickhard, 2008, 2009). Lewis focused on language as convention and defined convention (at least initially) in terms of *regularities* of behavior—which are intrinsically repeated. I do not disagree that language is conventional, but my primary concern here is on situation conventions as the proximate *focus* of linguistic interactions and only secondarily on the conventionality of language per se. Situation conventions are perhaps momentary relations of Schelling-coordination of action, utterance, and apperceptive understanding, and, although various properties of such coordination may continue ongoingly for some time—for example, *this* is a lecture situation for some while—nevertheless, the details will change from moment to moment and may never repeat.

<sup>12</sup>Note that situation conventions are not guaranteed. They involve the same fallibility of assuming that such coordination exists as do other aspects of the interactive situation. Thus, it is not possible to (infallibly) detect a convention, although one might correctly presuppose one nevertheless, but it is possible, at least in principle, to note that one's anticipations about the social situation are falsified.

<sup>13</sup>For further discussion of the ontology and epistemology of situation conventions, see, for example, Bickhard (1980, 2008).

<sup>14</sup>Note that relations do not have locations in the sense that we tend to assume for, for example, entities. For example, an instance of one city being in the relation of West relative to another city can be bounded in a certain *region*, but there is no particular *location* for the instantiation of that relation. So a situation convention, if it exists, exists as a relational organization among people's situation knowledges, but it does not have a particular spatial location. See Bickhard (2011) for arguments that classical entity-based metaphysical assumptions are false as metaphysics in general, although various properties such as boundaries, identity, individuation, and so on, can at times be contingently *created* in certain process dynamics.

Individuals who are participatively realizing a convention may or may not cognitively realize that they are doing so (e.g., young children, in general, do not recognize conventions as “conventional” even though they can participate in conventions—e.g., patty-cake) or may assume falsely that the current convention is something that it is not. If I assume that I am entering a birthday party when, in fact, it is a lecture, things will not proceed within the range of possibilities that I am ready for. Errors of assumptions concerning conventions thus manifest as failures of the situation knowledge anticipations that are involved.

## LANGUAGE

The encoding problems for perception and cognition also apply to considerations of language as encodings. Among other consequences, there is no way that language as encodings could be learned without already having language (Bickhard, 1980).<sup>15</sup> But what else could language be if not a system of encodings? In the interactive model, engagement with the world is via interaction with the world, including for language.

---

<sup>15</sup>The basic problem is that, in order to be able to understand an encoding, one must have knowledge of both ends of the encoding relationship *and* of the relationship itself. This is so whether the encoding is conventional—for example, Morse code—or natural—for example, neutrino counts in a gold mine in North Dakota that encode properties of fusion processes in the sun. Correspondingly, in order to *learn* an encoding, both ends and the relationship itself must be presented to the potential learner. But mental encodings are precisely what language encodings are supposed to give access to, so that access is already question-beggingly assumed in any encoding approach to language.

Conversely, if cognition and representation are *not* fundamentally constituted as encodings, then, according to any constructivist model (which includes the interactivist model), cognitive constructions for a given kind of situation will not necessarily be the same across situations or people. There is, thus, no common ground of encoding across situations or people that could be the ground for learning the encodings of language.

It might seem that some notion of *direct perception* could avoid this problem: if perception is “direct,” then perhaps it is constituted as some sort of direct impression of the world into the mind or brain, in which case perhaps there would be a common “ground” for learning the language encodings of—stand-ins for—those impressions. But this notion of “direct” yields a straightforward encoding model: in fact, it is close to Aristotle’s signet ring impressing itself into wax. If anything like that were the case, then perhaps we would have such a common ground (note that it assumes passive reception, not construction).

On the other hand, I argue that *Gibson’s* notion of “direct perception” does not have this consequence. Gibson meant by “direct perception” that there are no mediating perceptions. That is fully consistent with variability of interactions and constructions across situations and people and, thus, with the interactivist model (Bickhard & Richie, 1983). Such potential variability, however, provides no common ground for learning language as a system of encodings—as a system of “stand-ins.” Stand-ins for what, and how could that be learned? (And note that, in order to learn a language that you share, I have to learn a set of stand-ins for *your* internal states—which I don’t have access to.)

## Utterances as Operators

The model proposed here is that language is (an institutionalized) *conventional system* for generating conventional *utterances* that interact with—operate on—*situation conventions*. This involves a threefold social ontology of language: the social *situation*, the *utterance* as (approximately an) operator, and the *generative conventions* that yield the operative power (the apperceptive power) of utterances.

*Apperception of utterances.* All apperception transforms prior situation knowledge, including the apperceptions of utterances. Successful utterances, however, maintain the existence of the coordinative relationships that constitute conventions—but they change the specifics of those coordinative anticipations. An utterance, for example, might introduce a new topic into the common understanding of the situation, which might, in turn, permit new common resolutions of pronouns in further utterances. Utterances that evoke and modulate apperceptive processes are not encodings any more than for any other apperceptive processes.

## Some Consequences

There are multiple and multifarious consequences of this view of language. One immediate consequence is that all language, all utterances, are context sensitive. Apperceptive processes are intrinsically sensitive to the context of prior situation knowledge (and situation conventions). Such context sensitivity is recognized for some parts of language (e.g., Kaplan's character; 1979, 1989) but rarely for all of language.

Another consequence is that utterances have truth value, if they do at all, only in terms of their apperceptive consequences. Utterances transform (relations among) situation knowledge representations, and it is those representations that might have truth values, not the utterances per se. The situation is akin to functions on integers: integers have properties of being odd or even, but functions on them do not.<sup>16</sup>

A third consequence is an essential indexicality of language. Situation *knowledge* is agentive, thus, situated and from a point of view. Thus, situation *conventions* are also situated and from (relations among) points of view. The context sensitivity of utterances includes a necessary sensitivity to this intrinsic situatedness of what utterances interact with.

---

<sup>16</sup>Not even for constant functions, which utterances at times can partially approximate: such broad context sensitivity, broad enough to approximate a "constant operator," can be useful for some purposes.



As one illustration of context sensitivity, consider a sentence from Partee (1972): “The man who gave his paycheck to his wife was wiser than the man who gave it to his mistress.” The pronoun “it” in this sentence is not coreferential with its antecedent, but it *is* “codifferentiating” with its antecedent in the new context: “it” codifferentiates with the earlier “his paycheck,” but in the second context, it refers to the second man’s paycheck, not the first man’s paycheck.<sup>17</sup>

The sense in which differentiation is fundamental (not encoding) is also illustrated by a contrast between “John lost a black pen yesterday and Bill found it today,” in which there *is* coreferentiality, and

My home was once in Maryland, but now it’s in Los Angeles.

John thinks my home is in Maryland, but Bill thinks it’s in Los Angeles.

We need a secretary and we need her soon.

John could not catch a fish if it jumped into his lap. (Partee, 1972)

In these sentences we have no coreferentiality and, in some cases, no referentiality at all. Instead, we have various kinds of (context-sensitive) category differentiations. Unique “reference” is a pragmatic accomplishment, not a metaphysical, “denotational” or encoding, part of the semantics. Unique reference is accomplished when there is an attempt and a claim (which may be implicit, although it is often explicitly marked, e.g., by “the”) of *unique differentiation* and when that unique differentiation attempt is successful.

*Operators? Approximately.* Construing utterances, clauses, phrases, words, syllables, and so on, as operators is a first and, for some purposes, very useful idealization or approximation.<sup>18</sup> It captures part of the dynamics of utterances changing the linguistic situation conventions, as being akin to an operator or function (Bickhard & Campbell, 1992). It captures (soft) constraints involved in the (recursive) construction of compound “operator” utterances out of such words, clauses, and so on.

---

<sup>17</sup>There is a somewhat odd interpretation on which the “it” does corefer to the first man’s paycheck, but all that is needed for my point is the possibility, perhaps naturalness, of the interpretation in the main text.

<sup>18</sup>But can become pernicious when, as so often happens, formalization is taken as constituting or fully capturing language. This is not possible for any aspect of language: grammar, meaning, or pragmatics. (Even the standard definitions of syntax, semantics, and pragmatics are presuppositionally committed to a false underlying encodingism framework [Bickhard, 1980].) Nevertheless, the possibilities of such formal approximations explains why formalization seems to work as well as it does.

But, as mentioned, apperception is often not algorithmic: the “operators” have to be apperceptively interpreted, and that process too is not a matter of encoding or decoding. For suitably familiar kinds of utterances, the dynamics may be relatively smooth and can be approximated by a notion of operator. It is this possibility of approximation that permits the partial formalizing of language grammars: grammars capture the approximate constraints on how various kinds of operators can work together (or not) in generating resultant operators (Campbell & Bickhard, 1992).

But this relative smoothness (when it occurs at all) is a habituation of instances in which algorithmic approaches have not been learned or do not work. This can be the case for either producing language or understanding language, as in creative uses of language (e.g., poetry), children’s creative language (“I chalked the wall”), ancient texts, psychotherapy, and so on. In such nonhabituated kinds of languaging, apperception can be a variation and selection problem-solving process in which various possible understandings are tried out against various components of the utterance(s), immediate context, historical context, knowledge of the speaker, knowledge about the audience, and so on. This is a kind of evolutionary epistemology and is *not* captured by the “operator” analogy (Bickhard, 1980, 1995). For the apperception of language, this variation and selection process (of apperceptive processes, not of encodings) manifests as the hermeneutic circle (Ricoeur, 1977).

### Further Convergences

There are many convergences between this model and other action- and function-oriented approaches to language, but they tend to be partial, with ubiquitous assumptions of encoded propositions being present at some point in the models. These convergences include the following:

*Speech act theory*: speech acts are actions *but* with encoded propositions (Searle, 1969);

*Functional grammars*: grammatical forms and relations serve functions in constructing a sentence, *but* there is still an assumption of a core-encoded proposition with respect to the semantics of the sentence (e.g., Dik, 1978);

*Categorical grammars*: instances of grammatical categories serve functions in terms of how they relate to each other and how they generate instances of other categories, *but*, again, there is a basic assumption of encoded propositions, for example, as the base of the recursive definitions of the categories (Ajdukiewicz, 1935/1967; Montague, 1974; Reichl, 1982);

*Dynamic semantics*: there is a dynamics of changes of representation in such models, *but* the files that are “changed” contain encoded propositions, and it is the encoded propositions that are modified (Heim, 1983; Lewis, 1979);

*Grice*: addresses “pragmatic” issues, *but* speakers’ intentions are in terms of encoded propositions, and there are assumptions of (encoded) literal meaning (Grice, 1957, 1968, 1969, 1989);

*And so on.*

## CONCLUSION

The interactivist model constitutes a move to a completely (nonencoded) “operator” model:

- In which utterances are interactions with situation conventions,
- Which are constituted out of coordinative relations among participants’ situation knowledges, and
- Which are constituted as (webs of) indications/anticipations of interactive potentialities.

These are future-oriented, anticipatory, not backward-looking spectator models. Thus they avoid multiple aporia of encodingist models. They are based on interactions and differentiations, not on encodings. They account for multiple properties, such as ubiquitous context sensitivity, that otherwise are addressed, and must be addressed, in an ad hoc manner.<sup>19</sup>

## REFERENCES

- Ajdukiewicz, K. (1967). Syntactic connexion. In S. McCall (Ed.), *Polish logic 1920-1939* (pp. 207–231). London, UK: Oxford. (Original work published 1935).
- Bermudez, J. L. (2010). *Cognitive science*. Cambridge, UK: Cambridge University Press.
- Bickhard, M. H. (1980). *Cognition, convention, and communication*. New York, NY: Praeger.
- Bickhard, M. H. (1993). Representational content in humans and machines. *Journal of Experimental and Theoretical Artificial Intelligence*, 5, 285–333.
- Bickhard, M. H. (1995). Intrinsic constraints on language: Grammar and hermeneutics. *Journal of Pragmatics*, 23, 541–554.
- Bickhard, M. H. (2003). An integration of motivation and cognition. In L. Smith, C. Rogers, & P. Tomlinson (Eds.), *Development and motivation: Joint perspectives* (pp. 41–56). Leicester, UK: British Psychological Society, Monograph Series II.
- Bickhard, M. H. (2008). Social ontology as convention. *Topoi*, 27(1–2), 139–149.
- Bickhard, M. H. (2009). The interactivist model. *Synthese*, 166(3), 547–591.
- Bickhard, M. H. (2011). Some consequences (and enablings) of process metaphysics. *Axiomathes*, 21, 3–32. doi:10.1007/s10516-010-9130-z

---

<sup>19</sup>Encodings are intrinsically not context dependent, so context dependence, when recognized at all, cannot be addressed in an integrated manner within an encodingism.

- Bickhard, M. H. (2014). What could cognition be, if not computation ... or connectionism, or dynamic systems? *Journal of Theoretical and Philosophical Psychology*, 35(1), 53–66. doi:10.1037/a0038059
- Bickhard, M. H. (2015). *The whole person: Toward a naturalism of persons*. *Contributions to an ontological psychology*. Manuscript in preparation.
- Bickhard, M. H. (in press-a). Toward a model of functional brain processes I: Central nervous system functional micro-architecture. *Axiomathes*.
- Bickhard, M. H. (in press-b). Toward a model of functional brain processes II: Central nervous system functional macro-architecture. *Axiomathes*.
- Bickhard, M. H., & Campbell, R. L. (1992). Some foundational questions concerning language studies: With a focus on categorial grammars and model theoretic possible worlds semantics. *Journal of Pragmatics*, 17(5–6), 401–433.
- Bickhard, M. H., & Richie, D. M. (1983). *On the nature of representation: A case study of James Gibson's theory of perception*. New York, NY: Praeger.
- Bickhard, M. H., & Terveen, L. (1995). *Foundational issues in artificial intelligence and cognitive science: Impasse and solution*. Amsterdam, The Netherlands: Elsevier Scientific.
- Campbell, R. L., & Bickhard, M. H. (1992). Clearing the ground: Foundational questions once again. *Journal of Pragmatics*, 17(5–6), 557–602.
- Cummins, R. (1996). *Representations, targets, and attitudes*. Cambridge, MA: MIT Press.
- Dewey, J. (1960). *The quest for certainty*. New York, NY: Capricorn Books. (Original work published 1929).
- Dik, S. C. (1978). *Functional grammar*. Amsterdam, The Netherlands: North Holland.
- Dretske, F. I. (1988). *Explaining behavior*. Cambridge, MA: MIT Press.
- Fodor, J. A. (1978). Tom Swift and his procedural grandmother. *Cognition*, 6, 229–247.
- Fodor, J. A. (1987). A situated grandmother? *Mind and Language*, 2, 64–81.
- Fodor, J. A. (1990). *A theory of content and other essays*. Cambridge, MA: MIT Press.
- Fodor, J. A. (2003). *Hume variations*. Oxford, UK: Oxford University Press.
- Grice, H. P. (1957). Meaning. *The Philosophical Review*, 66, 377–388.
- Grice, H. P. (1968). Utterer's meaning, sentence meaning, and word-meaning. *Foundations of Language*, 4, 225–242.
- Grice, H. P. (1969). Utterer's meaning and intentions. *Philosophical Review*, 78, 147–177.
- Grice, H. P. (1989). *Studies in the way of words*. Cambridge, MA: Harvard University Press.
- Heim, I. (1983). File change semantics and the familiarity theory of definiteness. In R. Bauerle, C. Schwarze, & A. Stechow (Eds.), *Meaning, use, and interpretation of language* (pp. 164–189). Berlin, Germany: de Gruyter.
- Joas, H. (1993). American pragmatism and German thought: A history of misunderstandings. In H. Joas (Ed.), *Pragmatism and social theory* (pp. 94–121). Chicago, IL: University of Chicago Press.
- Kaplan, D. (1979). On the logic of demonstratives. In P. French, T. Uehling, Jr., & H. Wettstein (Eds.), *Contemporary perspectives in the philosophy of language* (pp. 401–412). Minneapolis: University of Minnesota Press.
- Kaplan, D. (1989). Demonstratives: An essay on semantics, logic, metaphysics, and epistemology of demonstratives and other indexicals. In J. Allmog, J. Perry, & H. Wettstein (Eds.), *Themes from Kaplan* (pp. 481–563). Oxford, UK: Oxford University Press.
- Lewis, D. (1979). Scorekeeping in a language game. *Journal of Philosophical Logic*, 8, 339–359.
- Lewis, D. K. (1969). *Convention*. Cambridge, MA: Harvard University Press.
- Millikan, R. G. (1984). *Language, thought, and other biological categories*. Cambridge, MA: MIT Press.
- Millikan, R. G. (1993). *White Queen psychology and other essays for Alice*. Cambridge, MA: MIT Press.

- Montague, R. (1974). *Formal philosophy*, R. Thomason (Ed.), New Haven, CT: Yale University Press.
- Newell, A. (1980). Physical symbol systems. *Cognitive Science*, 4, 135–183.
- Newell, A., & Simon, H. A. (1987a). Computer science as empirical inquiry: Symbols and search. In *ACM Turing Award lectures: The first twenty years, 1966–1985* (pp. 287–313). New York, NY: ACM Press and Reading, MA: Addison-Wesley. (Original work published 1975)
- Newell, A., & Simon, H. A. (1987b). Postscript: Reflections on the tenth Turing Award Lecture: Computer science as empirical inquiry. Symbols and search. In *ACM Turing Award lectures: The first twenty years, 1966–1985* (pp. 314–317). ACM Press and Reading, MA: Addison-Wesley: New York, NY.
- Partee, B. (1972). Opacity, coreference, and pronouns. In D. Davidson & G. Harman (Eds.), *Semantics of natural language* (pp. 415–441). Dordrecht, The Netherlands: Reidel.
- Piaget, J. (1954). *The construction of reality in the child*. New York, NY: Basic Books.
- Reichl, K. (1982). *Categorial grammars and word formation*. Tübingen, Germany: Niemeyer.
- Ricoeur, P. (1977). The model of the text: Meaningful action considered as a text. In F. Dallmayr & T. McCarthy (Eds.), *Understanding and social inquiry* (pp. 316–334). Notre Dame, IN: University of Notre Dame Press.
- Rosenthal, S. B. (1983). Meaning as habit: Some systematic implications of Peirce's pragmatism. In E. Freeman (Ed.), *The relevance of Charles Peirce* (pp. 312–327). La Salle, IL: Monist.
- Schelling, T. C. (1963). *The strategy of conflict*. New York, NY: Oxford University Press.
- Searle, J. R. (1969). *Speech acts*. London, UK: Cambridge University Press.
- Tiles, J. E. (1990). *Dewey*. London, UK: Routledge.