Logic and Ontology

JOHN T. KEARNS

Department of Philosophy
University at Buffalo
119 Park Hall
Buffalo, NY 14260
United States

Email: kearns@buffalo.edu
Web: https://www.buffalo.edu/cas/philosophy/faculty/faculty_directory/kearns.html

1. BARRY COMES TO UB

Barry Smith joined the philosophy department about the time I began my first term as chair. His coming to UB had already been arranged, for I wasn't involved in recruiting him and I didn't know him. But he soon made everyone's acquaintance. Peter Hare and Jorge Gracia each considered himself responsible for bringing Barry to the department, and I have no knowledge of which of them was right.

Anyway, Barry's joining us changed the character of the department, and he made the department a more intellectually lively place. He brought the editorship of the *Monist* with him, although that didn't impact the department so much, and he got involved with people and programs around the campus. At talks, he characteristically took it upon himself to show speakers what was wrong with whatever view they had presented, and his criticisms were frequently deserved. Barry also had philosophers whom he favored, and championed, especially David Armstrong and John Searle, even if they did occasionally get things wrong.

Barry became a member of the Center for Cognitive Science and, together with Len Talmy and Robert Van Valin, organized the First International Summer Institute in Cognitive Science. That was an intellectual success, but, as the dean regretted, not a financial one. Over the years Barry has organized many conferences, and brought many interesting faculty and students to campus from this country and abroad—sometimes to pursue degrees here, sometimes to work here as faculty, and sometimes to do research and to interact with us for shorter periods. He also organized one of the annual Wittgenstein conferences in Kirchberg, Austria.

Besides making the department more interesting and more fun, Barry's interests and activities, including his own work, have been quite helpful to me in my own philosophical projects. Barry is a "quick study;" he can take in a position or an argument quite quickly, and provide useful comments and criticisms. He is also good at seeing problems that need to be addressed, often addressing these himself, or trying to. His enthusiasm for philosophy and for doing philosophy is infectious. Philosophy probably is worthwhile!

At some point, Barry's interest in ontology became a passion for ontology, and he has since become something like the world's Chief Executive Ontologist (the world's CEO). In the past I have attended talks in which Barry claimed that ontology is the successor discipline to philosophy, and that he is an ontologist but no longer a philosopher. I think those claims were excessive, and that even Barry must realize this by now. For Barry is certainly still a philosopher, an insightful and successful philosopher, and it is also certainly ok to be a philosopher without being an ontologist or ontologer.

In connection with his ontological studies, Barry has had amazing success in obtaining grants to support research in ontology, including applied ontology, and in organizing and guiding the research of large numbers of people. He is the manager of a large and thriving ontological enterprise. Once, the dean of our faculty (who is now a former dean) remarked to me that Barry's research profile, in terms of publications and grants, was entirely comparable to those of leading faculty in natural science departments. Who would have thought that a philosopher could accomplish so much?

2. LOGICAL BEGINNINGS FOR ONTOLOGY

When Aristotle invented logic as a field of study, he seems to have been primarily concerned with proof or demonstration. He didn't design, or have any idea of, an artificial logical language, but instead made do with ordinary Greek expressions, which he both studied and employed. Aristotle wanted to understand how it is that simply by reasoning, often from what we know already, and sometimes from "scratch," we can obtain new knowledge. Although Aristotle was interested in determining (finding out) what things and kinds of things the world contains, that wasn't the focus of his logic.

Aristotle found, and focused on, sentences or statements such that if we use some of them to express what we know, this commits us to admit or grant or concede others of them to also be correct. From what we know, by reflecting on how the premiss statements are related to the others, we recognize that we can use the others to say what we then come to know. As it happened, Aristotle began by noticing the statements and the relations that are characteristic of what we now call syllogistic logic. And he seems to have thought that the middle term that occurs in the premisses but not the conclusion of a deductively correct syllogism plays an important role in extending a person's knowledge from the premisses to the conclusions of these arguments.

When Frege invented modern logic, he designed a perspicuous language for making factual statements which represent things as being this way or that, and formulated a deductive system for establishing that some sentences or schemas of this language are used to state logical laws (logical truths). Frege doesn't seem to have thought that his language reveals hidden features of ordinary language, for his logical language is based on his analyses of and reflections on ordinary language. But he was willing, in his formal language, to eliminate some natural-language features which complicate logical studies of language. For example, he thought it was convenient to have every singular term denote a real object.

If we regard Frege's logical language as a canonical language that might be used to represent things in the world, then this language is perspicuous in various respects. Its simple or atomic sentences are ontologically perspicuous, because categories of expressions correspond to kinds, or categories, of things in the world and the sentences represent things as being combined in ontologically appropriate ways. Frege's basic ontology is represented by singular terms and predicates. The singular terms represent (or pick out) objects, while the predicates indicate features of objects. These

predicates, one-place, two-place,..., n-place,..., provided a notational solution to philosophical problems and perplexities about making sense of relations.

The formal language is *logically* perspicuous for having both an ontologically perspicuous substructure and readily apparent logical expressions to be used for constructing compound sentences. (Frege's clumsy notation could have been more perspicuous logically, and was soon replaced by more convenient expressions.) The perspicuity of Frege's logical language is *visible* or *visual*. We can tell from the symbols used and their spatial arrangement what they are being used to do. Artificial logical languages are primarily written languages, while ordinary language, natural languages, are primarily spoken. Think how difficult it would be to teach modern logic to students blind since birth; syllogistic logic would not present similar difficulties.

Although Frege's logical language is ontologically perspicuous with respect to what its atomic sentences are used to represent, it might not be ontologically complete. It could fail to provide expressions, or kinds of expressions, for every kind or category of thing that needs representing. We know from various of his writings that Frege thinks objects and functions, which include concepts, are fundamental. Singular terms pick out objects, while predicates function in sentences or statements much like concepts behave in reality. When functional expressions are combined with names, or object expressions, the combinations represent functions "completed" by objects.

But does he think events are just another kind of object, or do they constitute a distinctive category which should have a corresponding syntactic or grammatical category of expressions? How should his language be adapted or enlarged to accommodate tenses, and to represent temporal relations? I doubt if we can answer these questions for Frege, but we *can* say that, as far as it goes, his language is ontologically and logically perspicuous. He has shown us what a visually perspicuous logical language looks like. Going beyond Aristotle's interest in proof and demonstration, Frege has made it a goal for logic to develop ontologically and logically perspicuous artificial languages.

This new goal is a further development of Aristotle's goal or goals. Frege, like Aristotle, is concerned with proof and demonstration. But Frege is particularly concerned with what we might call the logical structure of language. What he wants to prove are logical principles, or logical truths. As it turns out, ontological and logical perspicuity are helpful both for pursuing Aristotle's more limited goals and Frege's more general ones. Middle terms in syllogisms are not the

key to understanding how it is that deductively correct arguments can enlarge our knowledge. The logical structure of our language depends on more than the ontology it encodes, but this structure is based on the ontology.

Ordinary language doesn't conceal, or camouflage, its logical structure. Frege was content, in "On Sense and Reference," say, to analyze ordinary expressions which aren't somehow "fronting" for a concealed logical substructure that is what really matters. The logical language is more representationally perspicuous than ordinary language because it highlights the logical structure visually, although it doesn't uncover this structure. The perspicuous language facilitates the deductive reasoning that Frege carries out with sentences of the language.

Frege's formal language can be explored by starting with evident logical principles, and proceeding from these by inferences that evidently preserve both truth and logical truth, to establish further logical principles. For Frege, an important feature of his language was that proofs of logical principles can be checked mechanically, eliminating any need for appeals to intuition as one proceeds.

3. LEŚNIEWSKI'S LOGICAL SYSTEM

When I was an undergraduate at Notre Dame, I took a symbolic logic course taught by Bołeslaw Sobociński. He had taken one or more courses from Leśniewski before the Second World War, and had made his way to the United States following the war. Sobociński's course was devoted to a presentation of Leśniewski's system Ontology, although I think Sobociński preferred to call it the Calculus of Names. At the time, I had no idea what 'ontology' meant, or why the logical system was called that, and, as far as I can remember, Sobociński never told us. Speaking English wasn't so easy for Sobociński at that time, and he had very few conversational exchanges with members of the class. If he was asked to explain something, whatever he said was likely to be difficult to understand. His preferred method of teaching involved writing things on the board, which we copied. He wrote formulas and theorems and proofs.

I came to have a better understanding of Leśniewski's work when I was a graduate student, for I discussed his logical work in my dissertation, and was helped a lot by being able to borrow a copy of Eugene Luschei's then-recent dissertation about Leśniewski's logical systems. Luschei presented, and commented on, Leśniewski's rules (or directions) for constructing a system of Ontology. From Leśniewski's nominalistic perspective, there wasn't such a thing as *the* system of

Ontology. There were as many systems of Ontology as people actually constructed. The only systems of Ontology that there are are systems that one or another person constructs by writing them according to Leśniewski's directions. And each constructor is free to make her own choices of many of the symbols to be used. My better understanding of what Leśniewski was up to did not include understanding why the word 'Ontology' was a good one for him to use for labeling his logical system.

Now I think I do understand. Following Frege, coming up with an ontologically and logically perspicuous formal language came to be regarded as an important part of investigating modern logic. Since Leśniewski was a dedicated nominalist rather than an upper or lower case 'p' platonist, he designed a logical language suited for representing the world as he understood it to be, and he formulated a deductive system that facilitated making perspicuous derivations of logical principles "governing" the logical language. The syntax for his language and deductive system was presented in his Terminological Explanations, which are really directions for someone to follow in constructing (writing down) a system of Ontology. The directions provided for both the language and its development in the deductive system.

In Leśniewski's formal language, the basic category of expressions for objects is common nouns, or names, that stand for zero or more objects. The most basic atomic sentences are obtained by combining two names with the Greek letter epsilon: ε. This is not the epsilon of set membership, which I will write like this: **ε**. The Ontological epsilon is written between two nouns to make a sentence like this: *[a ε b]*, which is used to say that the single *a* is a *b*. If there are no *a*'s, or if there is more than one *a*, the sentence is false. The sentence is true if there is exactly one *a*, which is also a *b*. There is no fundamental category of singular terms, but when the writer understands a common noun of Ontology to stand for just one object, he can indicate this informally by using an upper case letter as a noun like this: *[A ε b]*. If both *'A'* and *'B'* are names of single objects, then we can write *'[A ε B]'* to indicate that these are the same object.

The Ontological epsilon is the only primitive symbol in Lesniewski's formal language that can be used to say that an object exists. Ontology has indefinitely many semantic, or grammatical, categories, and for each category there are variables belonging to that category, and universally and particularly quantified phrases which contain variables belonging to that category. A single quantified phrase can contain more than one variable, and the variables it contains can belong to different categories. Leśniewski understood quan-

tification substitutionally rather than referentially, which seems appropriate for a nominalist.

I don't think Ontology provides as convenient a formal language as do familiar systems of first-order, or higher-order, logic, at least not if we wish to capture features of natural languages. In English and other familiar natural languages, names and perhaps all singular terms constitute a distinctive category of expressions. In describing the world and its goings on, we pick out particular objects and characterize these objects, as well as indicating how they are related to one another. It is important to distinguish names and descriptive singular terms from ordinary common nouns. Names and other singular terms aren't common nouns that just happen to denote exactly one object. They are the very expressions we need for picking out the particular objects we want to characterize.

We *can* say things like the following:

There are two Arnolds in this class.
I never met an Arnold whom I liked.

but in these cases, the name isn't used in a typical way. In these cases, the speaker is using the name to mean *person named "Arnold."*

Leśniewski may not have cared about "capturing" the logic of ordinary language. By choosing the name 'Ontology' for his own system, Leśniewski was simply signaling his intention that the languages of those systems reflect or represent his own philosophical view. But no one anymore employs Leśniewski's formal language or deductive system.

4. FREGE'S *BEGRIFFSSCHRIFT*

In this work, Frege presented his fundamental logical system (or systems). In the language on which his system is based, the simple, or atomic, sentences are composed of names, or singular terms, and predicates. Frege doesn't in *Begriffsschrift* say anything about this language being ontologically perspicuous, but the language is surely intended to accommodate the kinds of expressions we use to pick out and characterize objects in our ordinary languages. For he provides us with singular terms for objects, and with n-place predicates for the concepts that objects in the world fall under. These predicates accommodate relations easily, something that Aristotle's logic couldn't accomplish.

Frege takes more care to ensure that his logical language provides a perspicuous representation of the speech acts, or language acts, that we perform than he does to let us know

that he has captured or represented the basic kinds of things that the world contains. He doesn't provide just names and predicates, connectives and quantifiers, but he also prefixes his sentences with *content strokes* and *judgment strokes.* An earlier analysis of our mental operations had recognized only three operations: conception, judgment, and reasoning. On this understanding, we begin by conceiving of objects and their features, then we combine our concepts to make judgments about the ways things are, and finally we reason from some judgments to further judgments.

Frege was sure that more than three operations are involved. After we conceive of objects and their features, we must assemble propositional items we can simply consider before we judge these to be or not be the case, then we pass judgment, and then we reason. Frege designed his formal language to reflect the mental operations we perform with expressions of that language. The vocabulary represents the conceptual element. When expressions are combined to form a sentence, that sentence is prefixed with the content stroke which represents the act of combining them. Once the sentence or statement is judged to be the case, the content stroke is prefixed with the judgment stroke. The content stroke and judgment stroke together constitute the sign of assertion: ⊢.

In providing the content stroke and the judgment stroke for his logical language, Frege was attempting to increase the ontological perspicuity of his formal language. His design of simple sentences provided ontologically perspicuous representations of objects as having properties and being related. His logical symbols were not entirely perspicuous presentations of the logical structures of his compound sentences, and his strokes were his attempt to provide ontologically perspicuous presentations of the speech acts or language acts being performed by the speaker, or language user.

But Frege's content stroke isn't needed, for the effect of using that stroke is achieved by assembling component expressions to produce a well-formed sentence (or schema). The assertion sign does have a role to play, however, for it makes the assertive force of the speaker's act explicit.

When Frege developed his logical system, each axiom and theorem was prefixed with the sign of assertion. But this sign was generally not understood, and eventually became used to signal other things than Frege had intended. The real problem is that, when Frege develops his deductive system by proving results, the content stroke and the judgment stroke don't do any work. The work of the content stroke is accomplished simply by writing a well-formed sentence or sentential expression. All of Frege's axioms and theorems are

either schemas whose instances are logical truths or general statements to the effect that all sentences/statements having the form displayed are logical truths. The system codifies logical truths, and providing a notation to indicate that Frege judges his theorems to be the case is unnecessary.

But Frege did have a good idea when he introduced symbols for making explicit the ontological status of the speech acts, or language acts, that the speaker is performing. Borrowing Austin's terminology, we can say that the act indicated by Frege's content stroke, the act of assembling expressions to make a significant statement, is a *locutionary* act, and the act of asserting that statement is an *illocutionary* act. In speaking, writing, or even thinking with words, we perform many different types of illocutionary acts. We assert statements, deny statements, and suppose statements to be or not to be the case. Assertions, denials, and suppositions are all illocutionary acts.

We also use sentences to make requests, to make suggestions, to give orders, to give advice, to make promises, to get married, to christen ships, and on and on. These are all different kinds of illocutionary acts. Illocutionary acts are the "units" of significant speech, of the significant use of language more generally. Long before Austin, Frege recognized locutionary and illocutionary acts, and provided for them in his notation. This was insightful, but went largely unnoticed, and didn't play an important role in Frege's own thought.

Since in Frege's logical system, he was only concerned to assert logically true statements, it wasn't instructive or enlightening to make this explicit. But if Frege had formulated a natural-deduction system instead of his axiomatic deductive system, then he might have helpfully introduced different symbols to indicate whether a statement is being asserted, or denied, or merely supposed to be the case. Making and discharging suppositions are essential to reasoning by natural deduction, and in that context it is enlightening to notationally distinguish assertions (or denials) from suppositions.

That is actually what I am trying to accomplish in my own work dealing with *illocutionary logic.* Until I set out to write this little essay, I wasn't particularly conscious of the ontological character, or the ontologically explicit character of my research. Now I see that in future work, I should highlight this character.

5. SPEECH ACTS, LANGUAGE ACTS, DOCUMENT ACTS?

We use language when we speak out loud, or when we write things, or even when we think using words and sentences.

When we speak out loud, we make sounds, when we write or type we make marks or visual patterns of some sort, and when we think with words, we presumably produce and employ neural events (without being consciously aware of those events). We also use language when we listen with understanding to someone else, or when we read. These are all examples of what I call speech acts, or language acts. The word 'speech' may be slightly misleading, but this isn't an obstacle to communication. In discussions of speech acts, it is common to restrict one's attention to those acts performed by the person who produces the expressions that are used, but I won't do that here.

Some philosophers think that people use language to introduce conceptual structure into the world, and to impose this structure on the world. I am sympathetic to that view, but I won't defend it here. However, I do think it is evident that people do, and must, perform acts when they say meaningful things by producing expressions and when they use expressions they encounter, for example when they hear or read these expressions, in appropriate meaningful ways. We can utter a name to refer to a particular object, and we can respond to someone else's utterance of that name by directing our attention to the referent. In either case we are performing a meaningful act. In either case, the act we are performing is a concrete entity, not an abstract one.

John Searle has developed a theory of how people create institutions, or institutional reality, by producing expressions and using them to perform certain types of collective speech acts. Barry Smith thinks that Searle has trouble reconciling that account of institutional reality with Searle's naturalism. According to Searle (as reported by Barry in Smith 2014), "Everything in the universe 'consists entirely of physical particles in fields of force.'" So, apparently, Searle really thinks that all of social reality is the product of "massive fantasy." Social reality isn't really real.

Barry is certainly right that such a view isn't satisfactory. But Barry thinks that the way to get out of, or around, Searle's difficulty is to introduce "quasi-abstract" entities into our ontology. I'm not sure I even understand this, but it does seem to be the case that what Barry calls "document acts" have some important role to play in producing and maintaining social institutional reality. What can these acts be?

In his paper "Document Acts" (Smith 2014, p. 19), Barry explains that document acts are "acts in which people use documents, not only to record information, but also to bring about a variety of further ends." Later in that page, he says that by 'document act' he means "*what humans (or other agents) do with documents,* ranging from signing or stamp-

ing them, or depositing them in registries, to using them to grant or withhold permission, to establish or verify identity, or to set down rules for declaring a state of martial law. Acts of these sorts deal with documents in ways which reflect the status of the latter as documents (rather than as, for example, mere pieces of paper)" (ibid).

I am willing to agree that documents are both interesting and important. But can the same be said of document acts? We could also recognize a kind of act we call 'automotive acts' or 'automobile acts,' which include all the things that people do with cars: start them, drive them, turn left in them, change their oil, repair them, run over people with them, go to the movies in them. Wouldn't it be simpler just to talk about cars instead of dealing with this strange category of acts?

Barry talks about document acts in some of the same ways that Searle talks about speech acts, especially in ways that Searle talks about those acts that give rise to institutions. In a chart with two columns, one for types of document and the other of entities created by document acts performed with those types of document, Barry indicates that contract acts create obligations, marriage license acts produce the bond of matrimony, and that a registration of baptism act creates a legal name. Can any of these things be true?

What is a contract act anyway? It can't be the act of two or more parties signing a contract, for that is a more ordinary kind of speech act/language act. And that act only exists while the signing is going on. Isn't it more accurate to say that the parties' signing the contract signal their agreement to abide by the terms of the contract, and that the signed contract is a record of that agreement? Their agreement itself is legally binding, but we need the contract to record and remind us of that agreement, and of what exactly was agreed to. We can, of course, do different things with the contract, but is it useful or helpful to lump together all the things we can do under the heading 'contract act'? A contract act isn't a very specific kind of act, although many of the things we can do with a contract are more ordinary types of speech acts or language acts.

Consider the marriage license I have to record my marriage to Jane. If that license is lost or destroyed, do we cease to be married? Suppose further that all records of our getting married are lost or destroyed. Would that end the marriage? No one thinks so. Documents and records of various sorts are certainly essential for our highly complex modern societies. These are often documents and records which concern one or another type of language act. But the documents and records are not themselves acts of some kind. We keep documents, but we don't perform them.

It was a big advance for human beings when they invented language and learned to perform speech acts. It was another big advance, but not quite as big as the first, when people developed written languages. That made it possible to record information, save it, transmit it to people at distant locations, and so on. It was also an advance when material to write on and instruments to write with became readily available. Each of these advances made it possible for people to do new things, to perform new kinds of act or action. But the advances themselves aren't acts of some kind, and neither are the documents that record acts already performed or enable acts that will or might be performed.

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