6. Predication and Preeminent Being

Beginning with Aristotle, the standard assumption in the history of ontology has been that being is not a genus, i.e., that there are different senses of being, and that the principal method of ontology is categorial analysis. This raises the problem of how the different categories of being fit together, and of whether one category is preeminent and the others somehow dependent on that category.

The different categorial analyses that have been proposed as a resolution of this problem have all turned in one way or another on a theory of predication, i.e., on how the different categories fit together in the nexus of predication. These analyses have differed from one another primarily on whether the analysis of the fundamental forms of predication is to be directed upon the structure of reality or the structure of thought. In formal ontology, the resolution of this problem involves the construction of a formal theory of predication.

Aristotle's categorial analysis, for example, is directed upon the structure of the natural world and not upon the structure of thought, and the preeminent mode of being is that of concrete individual things, or primary substances. Aristotle's realism regarding species, genera, and universals is a form of *natural realism*, in other words, and not of logical realism. Also, unlike logical realism, Aristotle's realism is a *moderate realism*, though, as we will explain, a *modal moderate realism* is better suited to a modern form of Aristotelian essentialism.

> *Moderate realism* = the ontological thesis that universals exist only *in rebus*, i.e., in things in the world.
>
> *Modal moderate realism* = the ontological thesis that universals exist only in things that, as a matter of a natural or causal possibility, could exist in nature, even if in fact no such things actually do exist in nature.

Predication is explained in Aristotle's realism in terms of two ontological configurations that together characterize the essence-accident distinction of Aristotelian essentialism. These are the *essential predicative nexus* between an object and the species or genera, i.e., the natural kinds, to which it belongs, and the *accidental, or nonessential, predicative nexus* between an object and the universals that inhere in it.

A formal theory of predication constructed as an Aristotelian formal ontology must respect this distinction between essential and accidental predication, and it must do so in terms of an adequate representation of the two ontological configurations underlying predication in an Aristotelian ontology.

Aristotle's moderate natural realism with two types of predication:

Predication of species, genera (natural kinds), and

Predication of properties and relations.

As a formal ontology, Aristotelian essentialism must contain a logic of natural kinds. In addition, as a form of moderate realism it must impose the constraint that every natural kind, property or relation is instantiated, i.e., that every natural kind, property or relation exists only *in rebus*. This constraint leads to Aristotle's problem of the fixity of species, according to which members of a species cannot come to be except from earlier members of that species, and that therefore there can be no evolution of new species.

> *The fixity of species:* Members of a species cannot come to be except from earlier members of that species. Therefore, there can be no evolution of new species.

This problem can be resolved in a modified Aristotelian formal ontology of *modal natural realism*, where the modal category of natural necessity and possibility is part of the framework of the formal ontology.

On this modified modal account, instead of requiring that every natural property or relation actually be instantiated at any given time, we require only that such an instantiation be within the realm of natural possibility, a possibility that might arise in time and changing circumstances and not just in other possible worlds.

Such a formal ontology will contain a modal logic for natural necessity and possibility, as well as a logic of natural kinds that is to be described in terms of that modal logic. Natural necessity is a causal modality based on natural kinds and the laws of nature, and as such it is not the same as logical necessity.

Logical necessity and possibility, as modalities, can be made sense of only in an ontology of **logical atomism**, an ontology in which there are only simple objects and only simple properties and relations, but no causal relations and therefore no natural necessity as a causal modality.

Plato's ontology is also directed upon the structure of reality, but the preeminent mode of being in this framework is not that of concrete or sensible objects but of the Ideas, or Forms. This leads to

(a) the problem of how and in what sense concrete objects participate in Ideas, and

(b) the problem of how and in what sense Ideas are "things" or abstract objects separate from the concrete objects that participate in them.

A Platonist theory of predication in contemporary formal ontology is the basis of logical realism, where it is assumed that a property or relation exists corresponding to each well-formed predicate expression (or open formula) of logical grammar, regardless of whether or not it is even logically possible that such a property or relation have an instance.

When applied as a foundation for mathematics, logical realism is also called *ontological logicism.*

The best-known form of logical realism today is Bertrand Russell's theory of logical types, which Russell developed as a way to avoid his famous paradox of predication (upon which his paradox of membership is based), a paradox not unrelated to Plato's problem of the separate reality of Ideas.

Whether and to what extent Russell's theory of logical types can satisfactorily resolve either of Plato's problems and be the basis of an adequate realist formal ontology is an issue that belongs to what we have called comparative formal ontology.

7. Categorial Analysis and Transcendental Logic

Kant's categorial analysis, unlike Aristotle's, is directed upon the structure of thought and experience rather than upon the structure of reality. The categories function on this account to articulate the logical forms of judgments and not as the general causes or grounds of concrete being.

There is no preeminent mode of being identified in this analysis other than that of the transcendental subject, whose synthetic unity of apperception is what unifies the categories that are the bases of the different possible judgments that can be made.

What categories there are and how they fit together to determine the concept of an object in general is determined through a "transcendental deduction" from Kant's table of judgments, i.e., from the different possible forms that judgments might have according to Kant. It is for this reason that the logic determined by this kind of categorial analysis is called *transcendental logic*.

The transcendental logic of Husserl is perhaps one of the best-known versions of this type of approach to formal ontology. According to Husserl, logic, as formal ontology, is a universal theory of science, and as such it is the justifying discipline for science. But even logic itself must be justified, Husserl insists, and that justification is the task of transcendental logic.

This means that the grounds of the categorial structures that determine the logical forms of pure logic are to be found in a transcendental subjectivity, and it is to a transcendental critique of such grounds that Husserl turns in his later philosophical work.

On the basis of such a critique, for example, Husserl gives subjective versions of the laws and rules of logic, such as the law of contradiction, the principle of excluded middle, and the rules of *modus ponens* and *modus tollens*, claiming that it is only in such subjective versions that there can be found the *a priori* structures of the evidence for the objective versions of those laws and rules.

Husserl also claims on the basis of such grounds that every judgment can be decided, and that a "multiplicity," such as the system of natural numbers, is to be "defined, not by just any formal axiom system, but by a 'complete' one". That is, according to Husserl:

> “the axiom-system formally defining such a multiplicity is distinguished by the circumstance that any proposition ... that can be constructed, in accordance with the grammar of pure logic, out of the concepts ... occurring in that system is either true—that is to say: an analytic (purely deducible) consequence of the axioms—or ‘false’—that is to say: an analytic contradiction—; tertium non datur.”

Unfortunately, while such claims for transcendental logic are admirable ideals, they are nevertheless in conflict with certain well-known results of mathematical logic, such as Kurt Gödel’s first incompleteness theorem.

8. The Problem of the Completeness of Formal Ontology

The transcendental approach to categorial analysis, as this last observation indicates, raises the important problem of the completeness of formal ontology.

It does this not in just one but in at least two ways: first, as the problem of the completeness of the categories; and, second, as the problem of the completeness of the laws of consequence regarding the logical forms generated by those categories.

> Two problems of the completeness of formal ontology:
>
> (a) the completeness of the categories; and
>
> (b) the completeness of the deductive laws with respect to those categories.

For Aristotle, for whom the categories are the most general “causes” or grounds of concrete being, and for whom categorial analysis is directed upon the structure of reality, the categories and their systematization must be discovered by an *inductive abstraction* and reflection on the structure of reality as it is revealed in the development of scientific knowledge.

The question of the completeness of the categories and of their systematization can therefore never be settled as a matter of *a priori* knowledge. This is true of natural realism in general.

Natural realism: the categories of nature and their laws are not knowable *a priori*.

For Kant and the transcendental approach, however, the categories and the principles that flow from them have an *a priori* validity that is grounded in the understanding and pure reason respectively—or, as on Husserl's approach, in a transcendental phenomenology—and the question of the "unconditioned completeness" of both is said to be not only practical but also necessary.

The difficulty with this position for Kant is that neither the system of categories nor the laws of logic described in terms of those categories can be viewed as providing an adequate system of formal ontology as we have described it above.

Kant's description of logic, for example, restricts it to the valid forms of the syllogism. But syllogistic logic alone cannot account for the complexity of many intuitively valid arguments of natural language, nor for the complexity of proofs in mathematics.

Husserl, unlike Kant, does not himself attempt to settle the matter of a complete system of categories, nor therefore of a complete system of the laws of logic or formal ontology; but he does maintain that such completeness is not only possible but necessary, and that the results achieved regarding the categories and their systematization must ultimately be grounded on the *a priori* structures of the evidence of a transcendental subjectivity.

> Transcendental logic: the categories and their laws are knowable *a priori*.

The transcendental approach, in other words, leaves no room for inductive methods or new developments in either logic or categorial analysis.

This is especially so in the way both logic and categorial analysis are affected by new results in scientific theory (e.g., the logic of quantum mechanics and the way that logic relates to the logic of macrophysical objects) or in theoretical linguistics, (e.g., universal grammar and the way that grammar is related to the pure logical grammar of a formal ontology), or even in cognitive science (e.g., artificial intelligence and the way that the computational theory of mind is related to the categorial and deductive structure of logic).

> Some categorial analyses not knowable *a priori*:
>
> (1) The logic of quantum mechanics and how that logic relates to the logic of macrophysical objects.
>
> (2) Theoretical linguistics: is there a universal grammar underlying all natural languages? And, if so, how is that grammar related to the pure logical grammar of a formal ontology?

(3) Cognitive science and artificial intelligence: are there categories and laws of thought that can be represented in formal ontology? And, if so, how are these categories and laws related to the categories of nature? And can they be simulated (duplicated?) in artificial intelligence?

Despite the difficulties with the problem of completeness of the *a priori* methodology of the transcendental approach, it does not follow that we must give up the view that an analysis of the forms of predication is to be directed primarily upon the structure of thought.

There are alternatives other than the transcendental idealism of either Kant or Husserl that such a view might adopt. Jean Piaget's *genetic epistemology* with its "functional" (as opposed to absolute) *a priori* is such an alternative, for example, and so is Konrad Lorenz's biological Kantianism with its evolutionarily determined (and therefore nontranscendental) *a priori*.

Some non-transcendental approaches:

(a) Jean Piaget's genetic epistemology (a non-absolute "functional" *a priori*).

(b) Konrad Lorenz's biological Kantianism (an evolutionarily determined *a priori*).

Any version of a naturalized epistemology, in other words, where an *a posteriori* element would be allowed a role in the construction of a formal ontology, might serve as such an alternative; and in fact such a naturalized epistemology is presupposed by conceptual realism, which we will describe in more detail later.

The comparison of these alternatives, and a study of their adequacy—as well as of the adequacy of a more complete and perhaps modified account of transcendental apriority—as epistemological grounds for a categorial analysis that is directed upon the structure of thought, are issues that properly belong to comparative formal ontology.

The transcendental approach claims to be independent of our status as biologically, culturally, and historically determined beings, and therefore independent of the laws of nature and our evolutionary history.

8. Set-Theoretic Semantics and Formal Ontology

The problem of the completeness of a formal ontology brings up a methodological issue that is important to note here. This is the issue of how different research programs can be carried out in restricted branches or subdomains of a formal ontology without first deciding whether or not the categorial analysis of that formal ontology is to be directed upon the structure of thought or the structure of reality.

We do not always have to decide in advance whether or not there must (or even ever can) be a final completeness to the categories or of the laws of logic before undertaking such a research program.

In particular, we can try to establish restricted or relative notions of completeness for special areas of a formal ontology, and we can then compare and evaluate those results in the context of comparative formal ontology.

The construction of abstract formal systems and model-theoretic semantics within set theory will be especially useful in carrying out and comparing such research programs. In other words, set theory is an ideal framework within which to carry out comparative analyses of different formal systems proposed either as a formal ontology or a subsystem of such.

We must be cautious in our use of set theory, however, and especially in how we apply such well-known mathematical results as Kurt Gödel's incompleteness theorems. Gödel's first incompleteness theorem, for example, does not show that every second-order predicate logic must be incomplete.

Now by second-order predicate logic we mean an extension of first-order predicate logic in which quantifiers are allowed to reach into the positions that predicates occupy as well as of the subject or argument positions of those predicates. What Gödel's theorem shows is that second-order predicate logic is incomplete with respect to its so-called *standard* set-theoretic semantics.

We must not confuse membership in a set with predication of a concept, property, or relation. Nor should we identify the logical concept of a class as the extension of a concept, property or relation with the mathematical concept of a set as based on the iterative concept, i.e., on Georg Cantor's power-set theorem that the set of all subsets of any given set has a greater cardinality than that set.

Cantor's theorem, while essential to the iterative concept of set, will in fact fail in certain special cases of the logical concept of a class—such as, e.g., the universal class as the extension of the concept of self-identity.

For this reason we should note that

- a representation of concepts by sets in a set-theoretical semantics will not always result in the same logical structure as a representation of those concepts by the classes that are their extensions, and
- an incompleteness theorem based on the one kind of structure need not imply an incompleteness theorem based on the other.

We should distinguish accordingly:

- (a) The logical notion of a class as the extension of a concept, whether in the sense of a class as many or a class as one.
- (b) The mathematical iterative notion of a set.

A set-theoretical semantics for a formal theory of predication must not be confused, in other words, with a semantics for that theory based on its own forms of predication taken primitively. For the latter is based on the very forms of predication that it is designed to interpret, and it is in that sense *an internal semantics* for that theory.

A set-theoretical semantics, on the other hand, is based on the membership relation, and hence on *an external semantics* for that theory of predication.

This means that in constructing a set-theoretical semantics for a formal theory of predication we must not confuse the internal content or mode of significance of the forms of predication of that theory with the external model-theoretic content of the membership relation, or (as in the case of a set-theoretic possible-worlds semantics) with the external content of any function (e.g., on models as set-theoretic representatives of possible worlds) defined in terms of the semantically external membership relation.

If we do not confuse predication with membership in this way, then we will be able to see why the incompleteness of second-order predicate logic with respect to its standard set-theoretical semantics need not automatically apply to any formal ontology designed to include second-order logic as part of its formal theory of predication.

The careful separation and clarification of these issues is a topic that belongs to the methodology of comparative formal ontology.

Distinguish:

(a) Predication in a formal theory of predication corresponding to a given theory of universals.

(b) Membership in a set based on the iterative concept of set.

Gödel's first incompleteness theorem does show that any formal ontology that includes arithmetic (as part of its pure formal content) must be deductively incomplete; that is, not every well-formed sentence of the pure logical grammar of such a formal ontology will be such that either it or its negation is provable in that formal ontology. Husserl's ideal of deductive completeness for an ontology that is designed to contain an "infinite multiplicity" such as arithmetic, in other words, just cannot be achieved.

But the deductive incompleteness of a formal ontology that contains arithmetic is not the same as the incompleteness of the categorial structure of that ontology, and in particular it does not show that the formal theory of predication that is part of that structure is also incomplete.

What must be resolved in a formal ontology that is to contain arithmetic as part of its pure formal content is the problem of how the possible completeness of its internal content as a theory of predication is to be distinguished from its necessary deductive incompleteness, and how within that pure formal content we are to characterize the content of arithmetic.

Finally, in regard to Gödel's second incompleteness theorem what must also be resolved for such a formal ontology is the question of how, and with what sort of significance or content, we are to prove its consistency, since such a proof is not available within that formal ontology itself.

These are issues that are to be investigated not so much in a particular formal ontology as in comparative formal ontology.

9. Conceptual Realism

Comparative formal ontology, as our remarks have indicated throughout, is the proper domain of many issues and disputes in metaphysics, epistemology, and the methodology of the deductive sciences.

Just as the construction of a particular formal ontology lends clarity and precision to our informal categorial analyses and serves as a guide to our intuitions, so too comparative formal ontology can be developed so as to provide clear and precise criteria by which to judge the adequacy of a particular system of formal ontology and by which we might be guided in our comparison and evaluation of different proposals for such systems.

It is only by constructing and comparing different formal ontologies that we can make a rational decision about which such system we should ourselves ultimately adopt.

I have myself constructed and compared a number of such systems and have come to the conclusion that the framework of conceptual realism is the formal ontology that we should adopt. Unlike the *a priori* approach of the transcendental method, which claims to be independent of the laws of nature and our evolutionary history, i.e., of our status as biological beings with a culture and history that shapes our language and much of our thought, conceptual realism is framed within the context of a naturalistic epistemology and a naturalistic approach to the relation between language and thought, thought and reality, and our scientific knowledge of the world. The following are some of the features of conceptual realism that we will cover in future lectures.

As a conceptualist theory about the mental acts that underlie reference and predication in language and thought, the categorial analyses of conceptual realism are primarily directed upon the structure of thought.

> The categorial analyses of conceptual realism are directed upon the structure of thought.

But what guides us in these analyses is the structure of language as a representational system, and in particular as a representational system that is categorially structured and logically oriented. Our methodology, in other words, is based on a linguistic and logical analysis of our speech and mental acts, and not, e.g., on a phenomenological reduction of those acts.

The realism part of conceptual realism, as we will see, contains both a natural realism and an intensional realism, each of which can be developed as separate subsystems.

One subsystem contains a modern form of Aristotelian essentialism, and the other contains a modern counterpart of Platonism based on the intensional contents of our speech and mental acts. We call these two subsystems conceptual natural realism and conceptual intensional realism.

The realism of conceptual realism contains two subsystems:

(1) a conceptual natural realism (as a modern form of Aristotelian essentialism), and

(2) a conceptual intensional realism (as a modern counterpart of Platonism).

In addition to the categorial analyses that are directed upon our speech and mental acts, conceptual natural realism contains a categorial analysis that is directed upon the structure of reality, and in particular an analysis in which natural properties and relations are taken as corresponding to some, but not all, of our predicable concepts.

Natural kinds are similarly taken as corresponding to some, but not all, of our sortal common-name concepts.

Natural kinds are not properties in this framework, however. The category of natural kinds is the realist analogue of a category of common-name concepts and not predicable concepts. Common-name concepts are a fundamental part of conceptual realism's theory of reference, just as predicable concepts are a fundamental part of conceptual realism's theory of predication.

Proper as well as common names are part of this theory of reference, and together both are described in a separate logic of names as another subsystem of conceptual realism. S. Leśniewski's ontology, which has also been described as a logic of names, is reducible to our conceptualist logic of names.

Conceptual intensional realism, on the other hand, is a logic of nominalized predicates and propositional forms as abstract singular terms.

That is, conceptual intensional realism is a logic of the abstract nouns and nominal phrases that we use in describing the intensional contents of our speech and mental acts. The intensional objects that are denoted by these abstract singular terms serve the same purposes in conceptual intensional realism that abstract objects serve in logical realism as a modern form of Platonism.

The difference is that, unlike Platonic Forms, the intensional objects of conceptual realism do not exist independently of mind and the natural world, the way they do in logical realism, but are products of the evolution of culture and language, and especially of the institutionalized linguistic practice of nominalization.

The way both forms of realism are contained within the general framework of conceptual realism shows how a modern form of Aristotelian essentialism is compatible with an intensional logic that is a counterpart to a modern form of Platonism.