Conceptual Natural Realism

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1. Conceptualism and Natural Realism

Conceptual intensional realism, we have noted, is similar to logical realism with respect to overall logical structure, and yet the two formal ontologies are different on such fundamental issues as the nature of universals and the nexus of predication.

The relationship between conceptualism and natural realism, on the other hand, is quite different. They do not, for example, have the same overall logical structure, and they also differ on the nature of universals and the nexus of predication. And yet, conceptualism and natural realism have been intimately connected with one another throughout the history of philosophy — though not always in an unproblematic way.

Conceptualism, on our present account, is a socio-biological theory of the human capacity for language, culture and thought, and therefore it must presuppose some form of natural realism as the causal ground of that capacity.

On the other hand, natural realism must in turn presuppose some form of conceptualism by which to explain our capacity for language and thought, and in particular our capacity to form theories of the world and conjecture about natural properties and relations as part of the causal order.

Conceptualism and natural realism, in other words, presuppose each other as part of a more general ontology, which, in one form or another, may be called **conceptual natural realism**.

The connection between conceptualism and natural realism goes back at least as far as Aristotle whose doctrine of **moderate realism**, i.e., the doctrine that universals "exist" only in things in nature, is well-known for its opposition to Platonism, i.e., the doctrine that universals exist as abstract entities independently of concrete objects.

Peter Abelard, in his *Glosses on Porphyry*, also dealt with the connection between the conceptual and natural orders of being. In particular, Abelard gave an account that is very much like Aristotle's in being both conceptualist and realist.

But in combining these positions, Abelard did not sharply distinguish the universals that underlie predication in thought from those that underlie predication in reality.

A universal, according to Abelard, seems to exist in a double way, first as a common likeness in things, and then as a concept that exists in the human intellect through the mind's power to abstract from our perception of things by attending to the likenesses in them.

What Abelard describes is a form of *natural realism*, where a property exists in the natural order as a common likeness in things; and yet if those things were to cease to exist, the property would somehow still exist in the human intellect as a concept.

A different interpretation was given by Aquinas in his distinction between the active intellect (*intellectus agens*) and the receptive intellect (*intellectus possibilis*), which are not really two intellects but two kinds of powers or capacities of the intellect *simpliciter*.

Aquinas developed the basic idea of conceptual natural realism, namely, that the problem of the "double existence" of universals is not an ontological problem but a problem of explaining how the same predicate can stand for, or signify, a concept in the mind on the one hand, and a natural property in nature on the other, where the natural property corresponds to, or is represented by, the concept. The two are not really the same universal, in other words, and do not even have the same mode of being.

Concepts cannot literally be the same as the natural properties and relations they purport to represent; and some concepts — especially those for artifacts and social conventions — do not represent any natural properties or relations at all.

2. The Problem with Moderate Realism

One reason why the universals of natural realism were confused with predicable concepts is that both can be designated by predicates. A predicate that stands for a concept, in other words, can also be taken to stand for a natural property or relation.

As Aquinas noted, the traditional problem about universals "existing in a double way" was really a matter of there being two ways in which a predicate can signify a universal, one way being primary in which the predicate stands for a concept, and the other being secondary in which the predicate stands for a natural property or relation that corresponds to that concept.

The sense in which a predicate stands for a concept is primary because it is the concept that determines the functional role of the predicate and the conditions under which it can be correctly used in a speech act. It is only by assuming that the truth conditions determined by the concept have a causal ground based on a natural property or relation that we can then say that the predicate also stands for a natural property or relation.

Even though the natural property or relation in question may in fact be the causal ground for our forming the concept, and therefore is prior in the order of being, nevertheless, the concept is prior in the order of conception.

The distinction between concepts in the order of conception and natural properties and relations in the order of being does not mean that there should also be a distinction between predicates that stand for concepts and predicates that stand for a natural property or relation.

The whole point of the double significance of a predicate is that the same predicate can stand for both a concept in the primary sense and a natural property or relation in the secondary sense.

Thus, it is not that the same universal can "exist in a double way," but rather that the same predicate can stand in a double way for both a concept and a natural property or relation — though it stands first for a concept, and then also for a natural property or relation — but only in the sense of an hypothesis about nature.

Similarly, a predicate variable can be taken in a double way to have both concepts and natural properties and relations as its values. The difference between the universals in the order of conception and those in the order of being is not about a difference between two "types" of predicate constants or variables.

The difference is really in the kind of reference that is made by means of predicate quantifiers. It is not a difference of types of predicate variables to which predicate quantifiers can be affixed, moreover, but a difference between the predicate quantifiers themselves, i.e., in the types of referential concepts the quantifiers stand for.

What we need to add to the second-order conceptualist theory of logical forms described in previous lectures are special quantifiers, $\forall^n$ and $\exists^n$, that can be applied to predicate variables, and that, when so applied, can be used to refer to natural properties and relations.

In this way Aristotle's moderate realism as a form of natural realism can be stated as follows:

(MR) $(\forall^n F^j)(\exists^e x_1)...(\exists^e x_j)F(x_1, ..., x_j)$,

where the quantifier $\exists^e$ is used to refer to actual (concrete) objects.

With the general object quantifiers (which are used to refer possible, actual and even abstract objects), we have the following as a consequence of this thesis:

$$(\forall^n F^j)(\forall x_1)...(\forall x_j)[F(x_1, ..., x_j) \rightarrow$$

$$E!(x_1) \wedge ... \wedge \ E!(x_j)].$$

Note: the monadic predicate $E!$ stands for the concept of concrete existence. This concept of existence is a logical construct, and hence there is no presumption that there is a natural property corresponding to it.

What the thesis of moderate realism, (MR), says is that natural properties and relations "exist" only as components of the states of affairs that obtain in the world (facts). It is in that sense that we say that a natural property or relations "exists" only in things.

This is too restrictive a view of natural realism, however. At the moment of the Big Bang when the universe was first formed, there was mostly raw energy and very few, if any, elementary particles. There were no atoms or molecules of any kind, all of which came later in the physical evolution of the universe. Most of the natural properties and relations that we now know to characterize atoms and compounds as physical complexes were not at that time realized in any objects at all.

But of course that does not mean that natural properties and relations did not have a real mode of being within nature's causal matrix at the beginning of the universe.

Even today there may yet *be* some transuranic elements, and natural properties of such, that, as a matter of contingent fact, will never be realized in nature by any objects at all, but which, nevertheless, as a matter of a natural or causal possibility, could be realized by atoms that are generated, e.g., in a supernova, or in a very high energy accelerator.

The being of such a natural property or relation does not consist of its being *in re* at some time or other in the history of the universe. Instead, its being consists of its being part of nature's causal matrix, and therefore of its possibly being realized in nature, i.e., of its *possibly being in re*.

One important consequence of this view is that natural properties and relations are not *intensional* objects, nor are they *objects* of any kind at all.

For if they were objects, then, in order to *"be"* even when they are not in things, they would have to be *abstract objects.* How could they *be objects*, in other words, when they are not in things, unless their being is that of an abstract object in a Platonic realm of forms, in which case they would have a mode of being that transcended the natural world and nature's causal matrix.

But natural properties and relations do not exist independently of the world and its causal matrix, even though they are not contained within the space-time causal manifold the way concrete objects are. Natural properties and relations cannot be objects, in other words, and therefore their mode of being as *possibly being in re* must have a different explanation.

As universals that correspond to concepts as unsaturated cognitive capacities, the most plausible explanation is that they too have an unsaturated nature, albeit one that is only analogous to, and not the same as, the unsaturated predicative nature of concepts.

As components of states of affairs, which we comprehend by analogy with the nexus of predication in thought, natural properties and relations are causally determinate *unsaturated* structures that become saturated in the states of affairs that obtain in nature, and that otherwise "exist" only within nature's causal matrix.

Thus, even though natural properties and relations do not "exist in a double way," one in nature and the other in the intellect, nevertheless, they have a mode of being as unsaturated causal structures that is *analogous* to that of concepts as unsaturated cognitive capacities, and hence their unsaturatedness must be understood by analogy with the unsaturated nature of concepts.

In terms of the theory of logical forms of a formal ontology, where predicates signify both kinds of universals, this means that both kinds of universals are values of predicate variables, albeit variables bound by different quantifiers, namely $\forall^n$ and $\exists^n$ in the case of natural properties and relations, and $\forall$ and $\exists$ in the case of predicable concepts.

Finally, we should note that just as predicable concepts do not exist independently of the general capacity humans have for language and thought, so too natural properties and relations do not exist independently of nature's causal matrix.

Thus, just as concepts have their being within the matrix of thought and concept-formation, so too natural properties and relations have their being within the matrix of the laws of nature.

3. Modal Moderate Realism

What is needed in the formal ontology of natural realism is a modal logic for a causal or natural necessity, or a causal or natural possibility. By a natural possibility we mean what is possible in nature, i.e., what is not precluded by the laws of nature.

A **natural necessity** therefore is what must be so because of the laws of nature. This suggests that **S5** is the appropriate modal logic for natural necessity, because possible worlds that have same laws of nature can be taken as accessible to one another and constitute an equivalence class.

Different equivalence classes of possible worlds will then represent different causal matrices as determined by the laws of nature that are invariant across the worlds in those equivalence classes.

Necessity, when interpreted as invariance over each equivalence class of a set of equivalence classes of models ("possible worlds") results in a completeness theorem for **S5** modal logic.

By a **causal possibility**, on the other hand, we mean what can be brought about in nature through causal mechanisms of whatever natural sort, physical, biological, etc. This suggests that **S4** is the appropriate modal logic to adopt, because whereas causal relations are transitive they are not also symmetric, and, as is well-known, **S4** is the modal logic characterized by a transitive accessibility relation between possible worlds.

We will not attempt to decide here whether the appropriate modal logic for conceptual natural realism is **S4** or **S5**. Instead, we will leave that decision to the different variants of this ontology that might be developed.

However, because **S4** is a proper part of **S5**, we will use **S4** here without assuming that **S5** is thereby precluded. In regard to notation, we will use $\Box^c$ for causal necessity and $\Diamond^c$ for causal possibility.

Now, instead of the ontological thesis of moderate realism (MR), we have the following ontological thesis of *modal moderate realism* as a fundamental principle of natural realism:

(MMR) $\quad (\forall^n F^j)\Diamond^c(\exists^e x_1)...(\exists^e x_j)F(x_1,...,x_j).$

Natural properties and relations "exist", in other words, not as components of actual facts, as was stipulated in the thesis of moderate realism, but as the nexuses of *possible* states of affairs.

What the principle of modal moderate realism, (MMR), says is that natural properties and relations "exist" as components of the nexuses of possible states of affairs, i.e., the states of affairs that can be caused to obtain in the world. It is in this sense that the being of a natural property or relation is its

possibly being *in re*.

There is no general comprehension principle that is valid in natural realism the way that a comprehension principle is valid for conceptual intensional realism. Natural properties and relations are not formed, or constructed, in terms of other properties and relations by logical operations.

But this does not mean that no natural property or relation can be specified in terms of a complex formula, i.e., a formula in which logical constants occur. What it does mean is that such a specification cannot be validated on logical grounds alone, but must be taken as an empirical hypothesis about the world.

Now in order to consider specifying natural properties and relations in terms of complex formulas, it is convenient to do so with some abbreviatory notation. In particular, we can use notation that *simulates* nominalizing predicates as object terms.

What we need to represent is a kind of identity between natural properties or relations:

$$(F^j \equiv_c G^j) =_{\mathbf{df}} \Box^c(\forall x_1)...(\forall x_j)[F(x_1, ..., x_j) \leftrightarrow G(x_1, ..., x_j)].$$

Unlike concepts, in other words, natural properties and relations are "identical" when, as a matter of causal necessity, they are coextensive.

Now the assumption that there is a natural property or relation corresponding to a given predicable concept that is represented by a complex formula, and hence by a λ-abstract, can be formulated as follows:

$$(\exists^n F^j)\,([\lambda x_1...x_j\phi] \equiv_c F)\,.$$

Here, unlike the comprehension principle of conceptual realism, such an assumption is at best only a scientific hypothesis, and as such must in principle be subject to confirmation or falsification.

4. Aristotelian Essentialism

Conceptual natural realism without natural kinds might be an adequate ontological framework for some philosophers of science**;** but to others, especially those who fall in the tradition of Aristotle and Aquinas, it is only part of a larger, more interesting ontology of Aristotelian essentialism. This is a framework that is a part of cosmology as well as of ontology.

It is part of cosmology because it is based on natural kinds as causal structures, and it is part of ontology because it determines two types of predication in reality, essential and accidental.

Natural kinds — whether in the form of species or genera, and whether of natural kinds of "things," such as plants and animals, or natural kinds of "stuff ", such as the chemical substances gold, oxygen, iron, etc., or compound substances such as water, salt, bronze, etc. — are the bases of essential predication, whereas predicable concepts and natural properties and relations are the bases of accidental, or contingent, predication.

The basic assumption of this extension of natural realism is that in addition to the natural properties and relations that correspond to some, but

not all, of our predicable concepts, there are also natural kinds that correspond to some, but not all, of our common-name concepts.

A natural kind is a type of causal structure, or mechanism in nature, that is the basis of the powers or capacities to act, behave, function, etc., in certain determinate ways that objects belonging to that natural kind have.

Natural kinds, in fact, are the causal structures, or mechanisms in nature, that underlie the causal modalities, and in particular they underlie the natural laws regarding the different natural kinds of things there are, or can be, in the world. In this ontology, natural kinds are an essential part of the internal hierarchical network of nature's causal matrix, and in fact they constitute the more stable nodes of that hierarchical network.

Now a natural kind is not a natural property or a "conjunction of natural properties," as David Armstrong and other philosophers have claimed. Rather, a natural kind is a type of unsaturated causal structure that is the causal ground of the events and states of affairs containing the natural properties that are said to "conjunctively define" that natural kind.

Indeed, if a natural kind were a conjunction of natural properties, then we would need an explanation of why some conjunctions result in a natural kind whereas others do not. Why, in other words, do not all "conjunctions of natural properties" result in a natural kind if some do?

If certain "conjunctions of natural properties" were to "produce," or "generate," a natural kind, whereas others do not, then that would suggest that there is more to a natural kind than just a "conjunction of natural properties."

In fact, the ontological dependence is just the opposite, because instead of a "conjunction of natural properties" being the causal ground of a natural kind, it is the natural kind that is the causal ground of the natural properties in the "conjunction".

Moreover, there really are no "conjunctions of properties" in nature, but only causally related groups of events or states of affairs having those properties as predicable components, which, of course, we could in principle describe in terms of a conjunction of sentences.

As a causal structure, a natural kind has an ontological priority over the natural properties that are predicated of the objects of that kind, a priority that is part of what Aristotle means in describing natural kinds as **secondary substances**.

A natural kind has a "substance-like" structure in that it is unsaturated in a way that is complementary to the unsaturated predicative structures of natural properties and relations.

The nexus of predication in reality, in other words, is a kind of mutual saturation of a "substance-like" natural kind structure, as realized by an object (*primary substance*) of that kind, with a natural property as a predicative structure, the result being an event or state of affairs that obtains in reality.

Of course, the fact that natural kinds are unsaturated causal structures to begin with allows for there being natural kinds that in fact are not realized in nature at a given time, but that could be realized, or brought about, in appropriate environmental circumstances. Transuranic elements of atomic numbers 113 and 115 have only recently been realized in nature, even though for just a few fractions of a second.

A natural kind, as an unsaturated "substance-like" causal structure, has its being in possibly being realized in things, and in that regard natural kinds can be realized in nature at different times in the evolution of the universe, or even possibly not at all.

It is because the being of a natural kind is its possibly being realized in nature, that Aristotle's problem of the fixity of species can be resolved in modal moderate realism.

The ontological difference between natural kinds and natural properties and relations is analogous to the conceptual difference between common-name concepts and predicable concepts and the way that referential concepts based on the former may be saturated by the latter in speech or mental acts.

Thus, just as a referential concept that is based upon a common-name concept can be saturated by a predicable concept in a speech or mental act, so too a natural kind, as the causal structure of an object of that kind, can be saturated by the natural properties of that object, the result being a complex of events or states of affairs having that object as a constituent.

Accordingly, just as a predicate expression can signify both a predicable concept and a natural property or relation, a common name can also signify or stand in a double way for both a concept and a natural kind as a causal structure.

Similarly, name variables can also be given a double interpretation as well. Thus, just as the quantifiers $\forall^n$ and $\exists^n$ can be affixed to predicate variables and enable us to refer to natural properties and relations, so too we can introduce special quantifiers $\forall^k$ and $\exists^k$, which, when affixed to name variables, enable us to refer to natural kinds.

For convenience, we will assume that object quantifiers range over all objects, single or plural, abstract or concrete, and actual or merely possible in nature. We also assume all the distinctions we have made in previous lectures, including those that are about classes as many and membership in a class as many. Thus, e.g., where A is a common name, then $x \in A$, i.e., x belongs to A-kind, if, and only if, x is an A, i.e.,

$$x \in A \leftrightarrow (\exists yA)(x = y).$$

Now because names can be transformed into object terms, we can state the fact that a natural kind A is not just contingently a natural kind, but that as a node in the network of nature's causal matrix it is necessarily so, i.e.,

(K1) $(\forall^k A)\Box^c(\exists^k B)(A = B)$.

Of course, that the extension of a common name A is co-extensive with that of a natural kind B, i.e.,

$$(\exists^k B)(A = B),$$

does not mean that A is itself a natural kind. Thus, assuming that the common name Man stands for a natural kind, but that the common name 'featherless biped' (i.e., 'biped that is featherless', in symbols, $Biped/Featherless$) does not, then even though all and only men are featherless bipeds (or so we will assume), i.e., even though it is now true that

$$Man = [\hat{x}Biped/featherless(x)],$$

nevertheless it does not follow that being a featherless biped is a natural kind. That Man is a natural kind, incidentally, can be formulated as

$$(\exists^k B)\Box^c(Man = B).$$

So-called "*real definitions*" can be described in terms of this notation by means of a specification of the following form:

$$(\exists^k B)\Box^c(B = [\hat{x}A/\varphi x]),$$

where A is a natural kind genus, and B is specified as a species of A the members of which satisfy the condition φx. This would **not** be a "nominal definition," i.e., a matter of introducing a simple common name as an abbreviation of a more complex common name; instead, it would be an hypothesis about the world, namely that there is a natural kind corresponding to the complex common name $[\hat{x}A/\varphi x]$.

A "real definition" is not a definition, in other words. It is an hypothesis about the members of a natural kind, e.g., $[\hat{x}A/\varphi x]$, being a species of a genus A.

5. Some Laws for Natural Kinds

There are a number of laws of natural kinds that can be formulated in this formal ontology. One such law is that an object belongs to a natural kind only if being of that kind is essential to it, i.e., only if it must belong to that kind whenever it exists as a real, concrete object.

This principle is formulated as follows:

(K2) $$(\forall^k A)(\forall xA)\Box^c\left[E!(x) \rightarrow x \in A\right].$$

In other words, where A is a natural kind, i.e., $(\exists^k B)\Box^c(A = B)$, and x is an A, i.e., $x \in A$, then x *is essentially an* A, which can be symbolized as:

$$\Box^c\left[E!(x) \rightarrow x \in A\right].$$

Essential predication is of course one of Aristotle's two types of predication. The other, accidental, or contingent, predication, is represented simply as $(\exists yA)(x = y)$, for "x is an A", or $F(x)$, for "x is F". Thus, given that Socrates is a teacher, but only contingently so, then this "accidental" predication is represented as follows:

$$(\exists x Socrates)(\exists y Teacher)(x = y).$$

Similarly, the accidental, or contingent, predication that Socrates speaks Greek can be symbolized as follows

$$(\exists x Socrates)F(x),$$

where the predicate 'speaks Greek' is represented by the predicate constant F. Thus, we now have a natural and intuitive way to represent Aristotle's two types of predication in our formal ontology.

Another law of our logic is that the being of a natural kind, like that of natural properties, is its possibly being realized in nature.

(K3) $$(\forall^k A)\Diamond^c(\exists^e x)(x \in A)$$

The quantifier phrase '$(\exists^e x)$' ('there exists') in (K3) can be replaced by the more general phrase '$(\exists x)$' ('there is'), because we assume that only concrete

existents belong to natural kinds. The following principle, in other words, is also an axiom of our logic of natural kinds.

(K4) $(\forall^k A)(\forall x)[x \in A \rightarrow E!(x)]$

Let us now adopt the following abbreviatory notation for the **subordination**, and **proper subordination**, of one kind to another,

$$A \leq B =_{\mathrm{df}} \Box^c(\forall x)[x \in A \rightarrow x \in B],$$
$$A < B =_{\mathrm{df}} (A \leq B) \wedge \neg(B \leq A).$$

The partition principle for natural kinds can be stated as follows:

(K5) $(\forall^k A)(\forall^k B)[\Diamond^c(\exists x)(x \in A \wedge x \in B) \rightarrow$

$$A \leq B \vee B \leq A].$$

In other words, if two natural kinds are not necessarily disjoint, then one must be subordinate to the other.

This means that *the family of natural kinds to which an object might belong forms a chain of subordination of one natural kind to another* — where each natural kind in the chain is, as it were, a template structure that is causally more determinate and finer-grained than the natural kinds to which it is subordinate.

Another partition principle is the thesis that every genus is the sum of its species:

(K6) $(\forall^k A)[(\exists^k B)(B < A) \rightarrow$

$$\Box^c(A = [\hat{x}/(\exists^k B)(x \in B \wedge B < A)])]$$

In terms of this view of natural kinds as template causal structures that can fit one within another, it is only natural to assume *a summum genus principle.*

The summum genus principle stipulates that *any chain of subordination between natural kinds must have a summum genus as an ultimate, superordinate template structure within which all of the natural kinds of that chain must fit.*

It is only in this way that the individuation of natural kinds of objects can even begin to take place in the universe as an ontological process.

Formally, the summum genus principle can be stated as follows:

(K7) $(\forall^k A)(\forall x)[x \in A \rightarrow$
$(\exists^k B)(x \in B \wedge (\forall^k C)[x \in C \rightarrow C \leq B])]$.

Thus, according to this thesis, any object that belongs to a natural kind belongs to a natural kind that is a summum genus, i.e., a natural kind that has subordinate to it every natural kind to which that object belongs.

Given the partition principle, (K5), (K7) is equivalent to the following alternative way of stating the summum genus principle, namely, that every natural kind A is subordinate to a natural kind B that is not properly subordinate to any other natural kind:

$$(\forall^k A)(\exists^k B)[A \leq B \wedge \neg(\exists^k C)(B < C)].$$

The opposite of a summum genus as the ultimate, superordinate causal template structure of a natural kind of object is the infima species of that object. This is the finest grained template structure determining the causal nature of that object.

The infima species principle stipulates that if an object belongs to a natural kind, then it belongs to a natural kind that is subordinate to all of the natural kinds to which that object belongs:

(K8) $(\forall^k A)(\forall x)(x \in A \rightarrow$
$(\exists^k B)[x \in B \wedge (\forall C)(x \in C \rightarrow B \leq C)]).$

A consequence of (K8) is the following alternative version of the infima species principle, namely, that every natural kind has subordinate to it a natural kind to which no other natural kind is subordinate:

$$(\forall^k A)(\exists^k B)[B \leq A \wedge \neg(\exists^k C)(C < B)].$$

There are other laws as well about natural kinds, but we will not go into them here.

6. Why Adopt Conceptual Realism:

In these lectures we have shown how conceptual realism:

• provides a logically perspicuous representation of our commonsense understanding of the world as well as of our scientific understanding;

• explains the nature of predication in thought as well as in language; and

• shows how a modern form of Aristotelian essentialism is compatible with an intensional logic that is a counterpart to a modern form of Platonism.

For these reasons and other reasons discussed elsewhere, such as

• explaining the distinction between being and existence; and

• giving an ontological, and not just a set-theoretical, account of modality.

conceptual realism is the formal ontology that I believe we should adopt.

7. Future Projects:

• **In Comparative Formal Ontology:** research and formalize traditional as well as modern new ontologies that have not been covered in these lectures; and then compare the resulting formal ontologies with one another as well as with conceptual realism.

• **In Conceptual Realism:**

a. Formalize a logic of mass nouns that is adequate for both our commonsense framework as well as for the Aristotelian ontology of natural kinds of "stuff". E.g., "furniture" is a mass noun of English for artifacts and does not have a natural kind corresponding to it. On the other hand, "gold", "lead", "iron", etc. are mass nouns that stand for natural kinds of "stuff", known as elements, and "water", "bronze", etc., are mass nouns that stand for natural kinds compounds.

Mereology, the logic of parts and wholes, is usually used for the logic of mass nouns. But there are questions about how a logic of parts and wholes can be combined with a logic of common count nouns, especially when contrasting kinds of "stuff" with kinds of "things".

b. Formalize a logic of events and states of affairs as truth-makers of our speech and mental acts.

These are important research projects, and I encourage all of you to work on these and related problems of both traditional and modern, new ontologies of the 21st Century using all of the tools of comparative formal ontology.