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Cognition by description

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ABSTRACT

One important aspect of the faculty of language, as understood in generative grammar, is its capacity to form operator-variable structures. Such structures are crucial for definite descriptions, as understood in the broadly Russellian tradition. The paper proposes a research program for exploring the relation between the uniquely human ability for "knowledge" (more properly, cognition) by description and the capacity of the language faculty to produce operator-variable structures.

Keywords: Merge, Internal Merge, cognition by description, theory of descriptions, knowledge by description, humaniqueness, language evolution, the language faculty.

I defend the reasonableness of a research program which applies ideas largely associated with Bertrand Russell's philosophy of language and epistemology toward explaining some elements of human cognitive uniqueness, what Marc Hauser has called "humaniqueness" (2009). It would be a program which rightfully blurs the distinction between philosophy and science, a distinction which has often been blurred before.

The program would be an attempt to understand how humans are capable of thinking about unobservables while other species are not. It does not entail the claim that this exhausts humaniqueness; there could well be other facets of humaniqueness not addressed in this paper. An analogous program, currently underway, is the attempt to understand the uniquely human ability for unbounded counting. There is empirical evidence indicating that this latter ability depends upon language (Spaepen *et al.*, 2011). It has been suggested by a number of cognitive scientists that the recursive nature of language underlies our capacity to grasp the integer series, on the grounds that this series can be recursively defined (Hauser *et al.*, 2002; Wiese, 2003).

I am proposing an analogous research program: the human ability to think of unobservables depends upon the ability to generate sentences containing definite descriptions. There are several different ways in which the idea could be developed, which is why I emphasize the word "program". It could be that sentences containing definite descriptions, produced by the language faculty, directly enter into thought. That could be the whole story. It is also possible that there is a pre-existing language of thought, lacking the power to produce definite descriptions just on its own, which is enriched by the language faculty. The language of thought could, for example, use the outputs of the language faculty as a template for forming its own definite descriptions. The power of the language faculty to form definite descriptions depends, in turn, upon its capacity to produce variables bound by quantifiers. In linguistics, this capacity is usually understood in terms of computations executed by the language faculty. This latter point will be elaborated upon in the course of the paper.

In saying that only humans think about unobservables, I want to clarify that I am not speaking of displaced reference per se. I am speaking of reference to objects and properties which lie

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beyond what the sense organs were designed to register ("design" here referring to design by natural selection). In other words, by hypothesis, there is an evolutionarily older semantic system oriented towards the observable environment, and a newer system, plausibly unique to our species (Berwick and Chomsky, 2016), which serves for representing unobservables as well. The challenge is to understand what is unique to this newer system, e.g. what computations belong exclusively to it.

That a mental system for tracking observables came first is virtually a truism. A number of philosophers have defended the view that responsiveness to the environment, via the sense organs, is a conceptually necessary condition for intentionality. Although couched in terms of conceptual necessity, the point is best understood as biological. Tracking environmental variables, and either changing the environment or one's relation to it, are what minds are for. According to Jonathan Bennett (1976), one can only understand intentionality in terms of goal-directedness; one can, in turn, only recognize goal-directedness if the organism "registers" features of its environment pertaining to changes needed to reach the goal. The organism may, for example, register the presence of food and thus be able to change its position to bring itself closer to the food. Quoting Gilbert Harman, "In elementary cases, a belief state that represents a particular thing normally results from the perception of that thing and leads to behavior involving that thing" (1973, p. 62).

Speaking of goal-directedness not only presupposes environmental sensitivities, but also the organism's making a mark upon the world. Given that there is no intentionality without goal-directedness, I have to express some sympathy with philosophers who have insisted that semantics involves, at least in the most primitive case, the effects of the sign. This includes both effects upon behavior as well as effects upon the environment resulting from behavior (Wittgenstein and Waismann, 2003, Ch. 5; Honderich, 2004, p. 193). Here too, we find observability. In the most primitive case, the organism exhibits goal-directedness by manipulating things which it can perceive. Tracking and reacting to objects in the environment is the background assumption of normality in interpreting an animal's mental semantics. Although this is far too simple for interpreting human mental semantics, the human ability to represent unobservables likely remains a derivative sort of meaning, contingent upon a more basic or core sort of mental semantics. This core would crucially involve connections to the environment via sense organs.

Turning to Russell, there are, of course, great differences between his approach and virtually any naturalistic approach. Be that as it may, I want to emphasize similarities. For Russell, semantics involves a core and a periphery: the core involves symbols which refer to observables, the periphery includes designation of unobservables via the addition of quantifiers to the lexicon (Russell, 1912, 2007; Ostertag, 1998). In other words, there is a relatively primitive system involving a semantics of observables, and a fortified system which crosses the line, so to speak, by including a semantics of unobservables. The latter is built upon the former as its foundation via the addition of quantification. (I am not including here Russell's discussion of logical data (1992, Ch. 9). Presumably, the semantics of logical constants can be understood in terms of their roles in inference relations, rather than acquaintance with abstract objects.) The addition of quantification to the system permits the definition of terms designating unobserved entities and properties in terms of their relations, often causal relations, with observed entities and properties.

One limitation in Russell's approach, in my opinion, was his focus on what has actually been observed, as opposed to what is observable. For example, a primitive, pre-quantificational system could perhaps be able to represent Hume's missing shade of blue, because the shade, even though never observed, is observable. That is, the primitive system is biologically adapted to represent all shades of blue, because the eyes were designed to be sensitive to the entire color spectrum. Furthermore, as will be discussed presently, the semantic system and the sensory organs were designed to work together. This picture of "primitive" thought without quantification is similar to C.R. Gallistel's view of non-human animal mental representation. Gallistel, summarizing literature on non-human animal cognition, characterizes it in terms of representations, where a representation is an isomorphism between a neural property or process and "an aspect of the environment to which these processes adapt the animal's behavior" (1990, p. 2).

For Russell, some expressions in human language which superficially appear to be names cannot be. He proposed that quantification serves to restrict the extension of a predicate, or conjunction of predicates, so that it applies to at most one thing, resulting in a phrase which resembles a name in its extension even though containing no constituent which could plausibly be identified as a name (except for predicates which could perhaps be construed as names of properties). For example, the act of building is observable. The Moon is observable. The one who built the Moon is not observable, but one can conceive of that entity by means of quantification. One way to do it would be to form the thought that there is exactly one x such that x built the Moon. This would explain the human ability to conceive of unobservables. Because this includes our myth-making capacity, I prefer the term "cognition by description" over Russell's "knowledge by description".

The details of the theory of descriptions have varied through the years, as it has been streamlined by various people (Chomsky, 1977; Neale, 1990). What matters for this discussion, and what is part of the core of the research program on offer, is the use of quantifier-variable constructions, as such, in the analysis of sentences containing descriptions. By means of quantification, the extension of a predicate can be restricted, for example, to one individual. Definite descriptions make it possible for us to think about things which are not observable, and quantification crucially enters into the analysis of sentences featuring descriptions. In other words, there is an ancient reservoir of semantic primitives belonging to a system designed only for tracking observables. But the addition of quantification allows one to construct new representations from this system for forming thoughts about unobservables. (It also permits one to represent observables in a new way.) Note that combinatorial functors as such would not suffice. Combining a symbol for wings with a symbol for horse is not enough for one to entertain the thought that there might be a horse with wings. That thought requires quantification.

The understanding of research programs here is Lakatosian (Lakatos, 1978). There is a hard core of assumptions which which serves as a constant backdrop, and inspiration, for more specific hypotheses. It is the latter which are directly tested. The hard core here would be the view that thinking of unobservables is unique to humans by virtue of the language faculty being unique to them. This faculty produces sentences containing definite descriptions, thus making cognition by description possible. A crucial factor in its producing sentences containing descriptions are the computational operations which produce the bound variables which enter into quantifier phrases. This much would be the hard core of the program. An example of a more specific hypothesis, outside the hard core, would be speculation as to the precise computations which set up the operator-variable relation. Hypotheses as to how specifically the language faculty interacts with other mental faculties, in the process of cognizing by description, would also lie outside of the hard core.

In fact, the ethologist Daniel Povinelli has already taken a similar approach to explaining the human capacity for thinking of unobservables, perhaps without realizing the similarity between his viewpoint and that of Russell. Povinelli has amassed a great deal of experimental evidence which, on his interpretation, supports the claim that simians do not mentally represent unobservables. For Povinelli, only a human can think of an unobserved *something-or-other* as playing a causal role in relation to observables, what Povinelli calls a "causal variable" (2012). The causal variable is something which is wholly defined, ultimately, in terms of its relation to observables.

One could point out a number of discontinuities between Russell and Povinelli: It is not entirely clear what logical form Povinelli has in mind, he does not explicitly refer to descriptions, and Povinelli is not discussing sense data. But I find the continuities with Russell more important than the discontinuities. Povinelli is at least implying that the human brain uniquely possesses some means of forming operator-variable structures for representing unobservables.

Observability

A core assumption of the program is that non-human mental semantics is designed to track observables, and fails to represent unobservables. An objection to the program is that it assumes a distinction which was apparently discredited long ago in the philosophy of science literature (Maxwell, 1962), namely the distinction between observational terms and theoretical terms. As part of a dialectic for discrediting this distinction, Paul Feyerabend proposed a criterion for distinguishing observational terms from theoretical terms which he then quickly dismissed in the face of a simple objection.

Provisionally, Feyerabend suggested that

> *a concept is an observational concept if the truth-value of a singular statement containing either only that concept, or that concept along with other observational concepts, can be determined quickly and solely on the basis of observation, or at least if it is imaginable that a decision of this kind will be possible someday (the backside of the moon was observable, in this sense, even* before *the publication of the first picture). A concept is a theoretical concept if in order to determine the truth-value of a singular statement which contains it, theories, in addition to observations, are also required (1960, p. 16).*[2]

As everyone knows, of course, Feyerabend proceeded to dismiss this attempt at drawing a distinction. He noted that science demands criteria for detecting the presence of even the most hidden, tiny, or distant phenomena, e.g. vapor trails in a cloud chamber indicating electrons. If the criteria are not yet available, the demand for criteria remains until they become available. With such criteria, a scientist can reach a point in which they quickly infer from the presence of the criterion to the supposedly theoretical entity. An electrician, to use one of his examples, can quickly check for the presence of voltage just by touching with a finger. But this ability dissolves the distinction between the observational and the theoretical, or at least this was Feyerabend's conclusion.

But why was the provisional distinction even remotely plausible in the first place? What does observability have to do with making a quick judgment? I submit that the operative concept here is naturalness. This was the grain of reason in the distinction, as Feyerabend framed it. There is a sense in which one applies observational concepts naturally whereas theoretical concepts are artificial. If this is the underlying distinction, we can drop the reference to speed of judgment. Natural selection will enter into the definition instead: our brains were designed by natural selection to represent objects and properties which our sense organs were also designed to register. In other words, the brain and sense organs were designed to work together. But the ability to think about unobservables, by contrast, would be an accidental offshoot of the language faculty, making it possible for the brain to form representations of things which the sense organs were not designed to register.

[2] English translation by D. Sirtes and E.M. Oberheim appears in Feyerabend (1999, p. 16-49). All quotes and page references in the text are to the latter.

Harman notes that, in the most elementary case, normal functioning constrains representation. I submit that normal functioning can be understood in terms of design. In the case of the human being, design is understood in terms of natural selection. Quoting Harman,

> *A device that takes data from radar and fires guns to shoot down planes represents the planes as at a particular location and as going to be at a different location. That description is appropriate because radar waves from the planes influence what we call the representation of the planes; and that representation plays a role in firing the guns that shoot them down. We can say this even though the guns miss as a result of a sudden change of course or even though a flock of birds sets off the cycle. We can say it because we have a conception of the normal operation of the device. That enables us to retain this way of talking about the device even when it is disconnected from radar and guns for a test in the laboratory. On the other hand, if our conception of normal working is different, the device must be described differently. If the planes are not likely to be what is responsible for the radar signals – and if the response is not correct for shooting down planes – and if nothing has gone wrong with the machine – then we would not suppose that it represents where planes have been and are going to be (1973, p. 63).*

In other words, the semantics of the device, specifically of its representations, is limited to observables. Further, what counts as an observable for the device is understood in terms of what the device was designed to track.

Note that this distinction between observables versus unobservables is only meant to cast light on cognitive evolution. It is not meant to do any work in epistemology, such as philosophy of science. It is perfectly compatible with the claim that there is no tenable theory/observation distinction in science, and perfectly compatible with Jerry Fodor's claim that

> *while observation is supposed to be constrained by a conceptual connection between what one can observe and how one can see things, the data for a theory are just whatever confirms its predictions, and can thus be practically anything at all (including, by the way, bits and pieces of other theories). So, the data for big bang cosmology include "observations" of the cosmic microwave background; the data for Mendelian genetics include the "observed" ratios of traits in the offspring of heterozygotes; the data for the gene theory include Mendel's "observation" (i.e., they include the Mendelian law) that heterozygotes breed true; the data for parsing theories include "observed" asymmetries of reaction times between subjects listening to sentences of related syntactic types. And so on. […] It's fine to let psychology settle what an observation is. And it's equally fine to forget about psychology and just let the observations be the data (Fodor, 1991, p. 208).*

For present purposes, I am letting evolutionary psychology settle what an observable is, but this is no comment whatsoever as to what count as data in science. It is simply an attempt to understand humaniqueness. Although I appeal to philosophy of science in discussing Lakatos, this is not philosophy of science.

Letting natural selection serve to distinguish observational representations from what could roughly be called theoretical representations must itself be an ongoing research program. The challenge would be to distinguish current utility from utility in the ancestral environment, only the latter being criterial for the distinction. The appeal to natural selection would thus initially yield only vague results. But at the beginning of a research program, vagueness is not a serious objection. Clarity is often the result of extensive research, rather than its precondition.

I do not believe that one should be deterred by arguments meant to show that the very concept of natural selection is confused. The important thing is that the research program of evolutionary biology remains progressive. It is well known that Fodor and Piattelli-Palmarini (2010) have argued that we should abandon natural selection as a scientific concept, on the grounds of its being incoherent (cf. Hornstein, 2010). To recap their argument very briefly: given that there are no laws of natural selection, the only way to distinguish blind selection from selection for a specific trait is to ascribe intentionality to natural selection. But evolutionary biology works with the notion of selection for specific traits. Given that this is supposed to be hard-headed science, one cannot treat natural selection as exhibiting intentionality: "natural selection doesn't have a mind" (Fodor and Piattelli-Palmarini, 2010, p. 120). Thus, we have a contradiction. But I do not believe that the contradiction is damning of scientific appeals to natural selection, even if an answer to the challenge is not immediately obvious. Lakatos noted that a research program can contain contradictions while remaining progressive (1999, p. 81ff). To use Lakatos' own example, Bohr's model of the atom contradicted Maxwell's theory, even though Bohr was firmly committed to the latter. In other words, Bohr was in the awkward position of affirming that electrons jump orbits while also assuming that electrons take a continuous, spiral path toward the nucleus. Lakatos also notes that Bohr was in the awkward position of contradicting geometry: the electron has no intermediate location when it jumps between orbits. However, in hindsight, we can say that Bohr was right not to abandon his model of the atom.

Internal Merge

Another possible objection concerns computation. The core of the research program refers to uniquely human mental comptuations, specifically whatever computations set up the binding relation between operator and variable. This program is not a form of computer functionalism, since it is not meant to apply to all mental states. However, some qualms about computer functionalism, suitably modified, might lead one to hesitate about the current program. Here is an illustration. In an article titled "Functionalism: Cognitive Science or Science Fiction?" (1998), Hilary Putnam notes that, in order to be scientific, computer functionalism must specify computations. One cannot empirically test functionalism without speaking of specific computations with specific empirical ramifications. One cannot reduce computational psychology to neuroscience — and this includes domain-specific reductions compatible with multiple realization — without indicating specific computational properties to be identified with specific neural properties. Without such specifications, computer functionalism is nothing more than science fiction, analogous to semantically empty talk of "dilithium crystals" and "warp drive" in *Star Trek*. We need to specify just which computations produce operator-variable constructions.

Fortunately, great progress has already been made in this regard. Contemporary generative linguistics posits a computational operation, known as Internal Merge, which generates such structures (Chomsky, 2007). So the humaniqueness of Internal Merge could explain the humaniqueness of cognition by description. This is one possible theoretical development of the research program, and I would like to dwell upon it.

Internal Merge is a subcase of a broader category of computations collectively known as Merge. Merge as such is a structure building operation which is used in contemporary minimalist linguistics to build parsing trees. Understanding how these trees are composed is scientifically important, as studies involving brain imaging reveal that sentence structure is hierarchical (Pallier *et al.*, 2011) and hence tree-like. Theoretically, Merge is an unconscious computation occurring in the brain. Two syntactic constituents merge together at a time to form a branching structure. Given that Merge is recursive and sometimes operates in parallel, a parsing tree is composed from the bottom up. For example, the word eat merges with the word *apples* to form the verb phrase *eat apples*. The verb phrase *eat apples* can then be merged with the infinitive particle *to* to yield the infinitive phrase *to eat apples*. These phrases are understood as unordered sets which the systems of articulation and perception necessarily force into a linear format, partially on the basis of their hierarchical structure. In the case of "They had wanted to", the spoken word order bears a clear relation to the hierarchical structure of the sentence: {*they*, {*had*, {*wanted*, {*to*, x}}}}.

Let's consider the generation of a definite description, namely *what boys eat*. Note that this phrase is roughly synonymous with *the thing boys eat*, or *that which boys eat*, or *the x, such that boys eat x*, or *for which x, boys eat x*. It also has a plural interpretation, but note that some variants of the theory of descriptions assimilate singular and plural forms of definite descriptions, offering a single account for both (Chomsky, 1977; Neale, 1990). Quoting Bolhuis *et al.* (2014, p. 2):

> *In our example "(Guess) what boys eat," we assume that successive applications of merge … will first derive* {boys, {eat, what}}*— analogous to* {boys, {eat, apples}}. *Now we note that one can simply apply merge to the two syntactic objects* {boys,{eat, what}} *and* {what}, *in which* {what} *is a subcomponent (a subset) of the first syntactic object rather than some external set. This yields something like* {what, {boys, {eat, what}}}, *in this way marking out the two required operator and variable positions for* what.

In other words, *what* in the superordinate position functions as an operator binding an unpronounced variable serving as the direct object of *eat*:

what boys eat (*what*) = *the x such that boys eat x*.

The pronounced *what* binds the variable, i.e. determines its semantic properties, by virtue of the two objects being token identical, i.e. the same token occupies both positions. "At the sensorimotor side, only one of the two identical syntactic objects is pronounced, typically the structurally most salient occurrence" (Chomsky, 2007, p. 21). Given that *what* is a subcomponent of a syntactic object appearing at an earlier stage of the derivation, the form of Merge in question is known as Internal Merge (IM). It stands in contrast to External Merge (EM) which merges copies of items from the lexicon, or possibly some other external source. Hence, merging *eat* with *apples* to yield *eat apples* is EM. External Merge merges an object taken (or copied) from outside the derivation, while IM merges an object taken (or copied) from an earlier stage of the derivation.

This is consistent with the *eat* in *what boys eat* requiring a direct object even though none is pronounced, the unpronounced variable serving as the direct object of *eat* (Chomsky, 2012, p. 264). This illustrates displacement in which an object is interpreted as though it is in one position even though it is pronounced in a different position, as in *That I undertand*. The binding relation is thus accounted for as a special case of the identity "relation"; *what* determines the semantic properties of <u>*x*</u>, in the expression {*what*, {*boys*, {*eat*, <u>*x*</u>}}}, because *what* and <u>*x*</u> are the same token object.

On Figure 1 IM is represented by an arrow, which is standard. Note here that *the food the boys will eat* fits Russell's definition of a definite description, given that it has the form *the so and so*. The phrase *the food*, in superordinate position, functions as a kind of operator binding the unprounced variable in subordinate position, usually referred to as a trace (t).

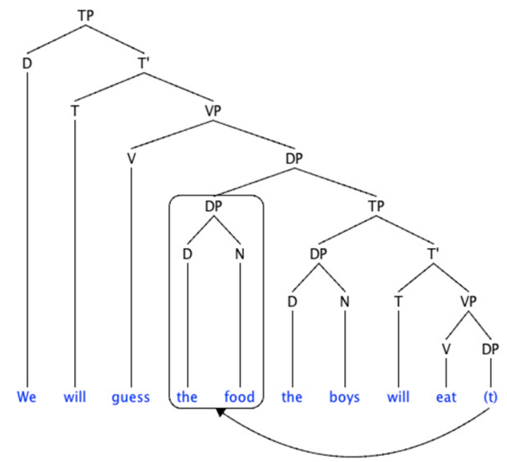

Figure 1. A parsing tree illustrating the formation of an operator-variable structure by means of Internal Merge.

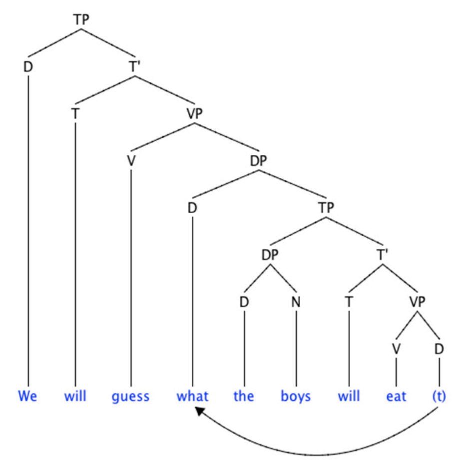

Figure 2. An operator-variable structure in which "what" has been internally merged.

The meaning of the definite description is something close to *for which food x, the boys will eat x*. The sentence is semantically close to *We will guess what the boys will eat* (Figure 2).

Apart from semantics, there is syntactic evidence for an unpronounced variable bound by the superordinate operator. This sort of evidence is familiar from the syntax literature (Radford, 1997 and references). Note the following pattern:

Plato said it
what Plato said
*what Plato said *it*

Only the third phrase is poorly constructed, as indicated by the star, and this is presumably because an unpronounced object functioning as the complement of *said* blocks insertion of another constituent, such as *it*. The presence of a phonetically null variable also prevents full contraction. Note the following pattern:

he has said it
he's said it
What he will say has been contested.
*What he will *say's been contested.*

The contraction *say's* in the fourth construction sounds deviant, even though it is intuitively acceptable to say *he's said it*. This is consistent with there being a variable in the complement position after *say* blocking full contraction. Here is a parsing tree for a sentence containing the definite description *the thing (that) he will say* (Figure 3).

The internally merged object in the superordinate position functions as operator, and in the subordinate position as bound variable (Figure 4).

On Figure 4 we see a semantically close sentence, with the definite description being headed by a wh- word. This evidently can also function as an operator. In both cases, the presence of the unpronounced variable blocks full contraction of *say* with *has*.

If Internal Merge is unique to humans, this would explain why religion is unique to humans. Theoretically, IM is crucial for such definite descriptions as

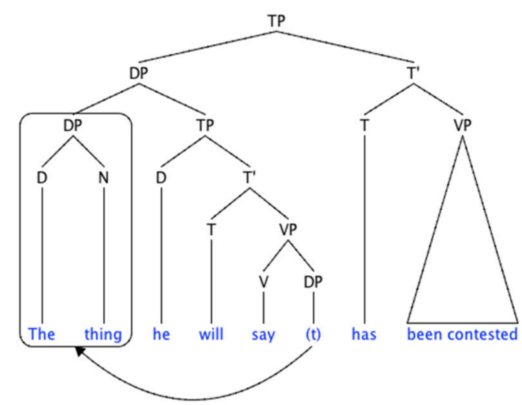

Figure 3. An illustration of the unpronounced trace between "say" and "has".

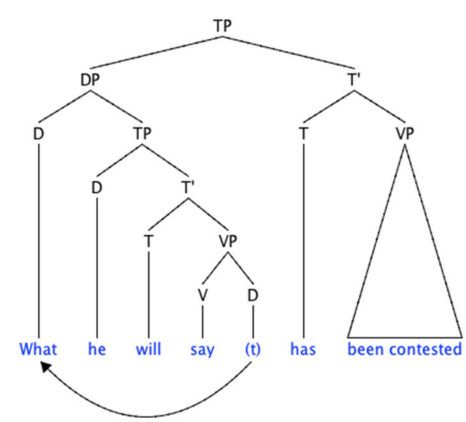

Figure 4. A variant of the sentence in Figure 3.

whom the celestial spheres move for = *the x such that the celestial spheres move for x*
whom the starry sky hides = *the x such that the starry sky hides x*
whom the mountains evidence = *the x such that the mountains evidence x*
(Note that *evidence* in the above is used as a verb.)

In other words, IM plays a role in the construction of phrases used to define terms meant to designate divinities. The humaniqueness of IM would also account for a crucial component of human scientific capacity. By extension, the ability to represent definite descriptions would play a crucial role in uniquely human curiosity (İnan, 2012).

IM just as plausibly enters into the construction of wh-phrases used in defining scientific terms, e.g.

what electricity evidences = *the x such that electricity evidences x*
what magnetic attraction evidences = *the x such that magnetic attraction evidences x*
what planetary perturbations evidence = *the x such that planetary perturbations evidence x*

Earlier, I suggested that natural selection could serve as a criterion for distinguishing an observational conceptual system from the added capacity for generating theoretical concepts. Note that if one uses natural selection to identify which mental representations are observational then our grasping of the integer series would also count as cognition by description. It is not likely that unbounded counting is a Darwinian adaptation, since it is exercised in few gatherer-hunter cultures. It is more plausibly viewed as a side-product of Merge which also accounts for the unboundedness of language by reason of being recursive: "If the lexicon is reduced to a single element, then unbounded Merge will easily yield arithmetic" (Chomsky, 2007, p. 20). Note also that, like descriptions, the use of integers plausibly involves quantifier-variable structures, e.g. *there are 5 x, such that … x*. Hence, the attempt to understand cognition by description in terms of variable binding could perhaps be combined with the attempt to understand counting in such terms.

Why would IM be unique to humans? There are at least two possibilities. One is that Merge as such is unique to humans (Hauser *et al.*, 2002; Bolhuis *et al.*, 2014). Another possibility is that, while Merge may play some cognitive role in other species, the specific sub-case of Merge known as Internal Merge is nonetheless uniquely human. (In other words, IM could be the "narrow language faculty" (cf. Hauser *et al.*, 2002; Fitch *et al.*, 2005), rather than recursion per se.) One possible explanation for this could be that IM places demands on working memory which EM alone does not require (Piattelli-Palmarini and Uriagereka, 2005; Uriagereka, 2008). Note that the arrow symbol in each of the parsing trees above represents a stage in the derivation of the sentence in which an earlier stage is accessed. The necessary search procedure — seeking an appropriate constituent from an earlier derivational stage, known as "Probe-Goal search" (Chomsky, 2001) — is a cognitive expense not incurred by EM alone. Some linguists have argued that EM is more cognitively expensive than IM, since the former involves scanning the entire lexicon for a suitable item, a much larger search space than merely probing the derivational history (Larson, 2015 and references). But this overlooks the distinction between short-term memory versus long-term memory. IM exercises the former, while EM, as it involves external, presumably lexical, search, exercises the latter. It is perfectly conceivable that a system would have a well-developed long-term memory capacity and a relatively undeveloped short-term memory capacity. As we are speaking here of hominin evolution, the question is clearly empirical.

A final point: there is something of a rumor in cognitive science that generative grammar neglects semantics. If one assumes this to be true, one may wonder how the mere addition of a syntactic operation could have such significant cognitive effects as those suggested above. To the contrary, the discussion of this paper illustrates that generative grammar does not neglect semantics. The point of Chomsky's modularity is that syntax is more basic than semantics, not that the two have totally independent existences. Syntax is independent of semantics in something like the way that atoms are independent of mountains: you can say what an atom is without mentioning mountains, but this does not mean that there could be mountains without atoms. One can explain what Internal Merge is without any mention of semantics. But that does not mean that there could be the semantics of quantifier phrases without Internal Merge.

My aim has been to show that, despite possible objections, there is enough plausibility in this program to make it worthwhile to pursue. The fundamental idea is that the uniquely human language faculty carries with it the computational power to generate quantifier phrases, which enter into definite descriptions and cognition by description in ways already familiar to the philosophical community. This capacity makes it possible for humans, but not other species, to think about unobservables. The project of developing this idea in detail is potentially highly cross-disciplinary with contributions from biology, linguistics, neuroscience, paleoanthropology, and archaeology, as well as from philosophy of language and epistemology.

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