How to improve on Quinian bootstrapping – a response to nativist objections

Zoltan Jakab (zoltan.jakab@barczi.elte.hu)

Institute for Psychology of Special Needs, Loránd Eötvös University, Ecseri út 3
1097 Budapest, Hungary

Abstract

Quinian bootstrapping is Susan Carey's solution to Fodor's paradox of concept learning. Carey claims that contrary to Fodor's view, not all learning amounts to hypothesis testing, and that there are ways in which even primitive concepts can be learned. Recently Georges Rey has argued that Carey's attempt to refute radical concept nativism is unsuccessful. First it cannot explain how the expressive power of mental representational systems could increase due to learning. Second, both Fodorian circularity charges and Goodmanian problems of indeterminacy apply to Carey's examples of Quinian bootstrapping. I argue that Carey's examples of bootstrapping can be amended to escape Fodorian and Goodmanian objections. I suggest some ways to improve on our models of concept learning to this end. I also argue that skill learning is the way for mental representational systems to increase their own expressive power, that is, to enrich their conceptual repertoire beyond what compositionality alone affords.

Keywords: Quinian bootstrapping; nativism; concept learning; expressive power

Introduction: Fodor's paradox

Jerry Fodor's famous argument for concept innateness has taken different forms. According to its early version (Fodor, 1975, 1981), all learning is hypothesis testing, and to formulate a hypothesis one needs to possess all the concepts that the hypothesis involves. Therefore, in the course of learning one can seek for evidence supporting or undermining a hypothesis, but formulating hypotheses will never result in the acquisition of new concepts. In order to work, this argument needs an immediate qualification. Some concepts are structured, whereas others are not; they are primitive. At any rate, this distinction holds on Fodor's own representational theory of mind which endorses compositionality. Complex concepts arise as combinations of primitives (or simpler complexes). For example, WHITE RAVEN[1] is a complex concept which has two constituents: WHITE and RAVEN; the two constituents are related by a conjunction. Now if one wishes to test the hypothesis that *White ravens are quite rare*, and it is conceded that forming WHITE RAVEN out of WHITE and RAVEN counts as learning a new concept, then evidently hypothesis formation makes room for concept learning. For more complex cases the idea that compositionality affords concept learning does

often sound intuitively plausible.[2] Hence Fodor's early view on concept acquisition, according to which primitive concepts cannot be learned, and so they must be innate. In Fodor (1990, 1998) this idea is supplemented by argument that most of our concepts are primitive, giving rise to radical concept nativism.

More recently, Fodor (2008) has found this conclusion much too weak, and formulated a stronger version according to which the obstacle to concept learning is not that most concepts are primitive, but rather that compositionality cannot increase the *expressive power* of cognitive systems. Very roughly, expressive power is the range of concepts and hypotheses (theories, conceptions) that a given representational system *could* formulate, or express, given its primitive symbols (concepts) and rules of combination. As we currently understand cognition, any case of learning seems to be underlain by some mental process that exploits compositionality: forming complex mental representations out of simpler ones governed by rules, plus adjusting certain parameters of the primitives.[3] If this is how cognition operates, then all that learning can achieve is the manifestation of what's born with us: we actually come to express what we are innately capable of expressing. In formal logic, building new complexes out of primitives (symbols and rules of combination) does not count as increase in expressive power – only adding certain new primitives[4] does. The same restriction seems to apply in the realm of mental representation, if indeed compositionality is the only game in town for cognitive theorizing.

In sum, since no cognitive mechanism that we can currently think of transcends compositionality, and compositionality cannot increase expressive power beyond one's innate endowment, no cognitive mechanism can increase the expressive power of mental representational

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[1] Concepts here are denoted by the name of their referent typed in upper case letters.

[2] For example, learning the idea of MOVING THE KING TWO SQUARES TOWARDS A ROOK ON THE PLAYER'S FIRST RANK, FOLLOWED BY MOVING THE ROOK ONTO THE SQUARE OVER WHICH THE KING CROSSED (i.e., CASTLING in chess) may strike one as a case of *bona fide* concept learning.

[3] Many examples support this generalization from the formation of perceptual prototypes to the construction of schemas, scripts, mental models, and propositional representations. As Carey (2009) says, it is a truism that all learning involves building new representations from antecedently available ones.

[4] I.e., adding new operators, predicates, etc. *with content that no combination of the earlier set of primitives could represent*. One example is adding the modal operators 'possibly' and 'necessarily' to classical propositional logic.

systems. Now if genuine concept learning requires increase in expressive power, then no cognitive mechanism that we can currently think of amounts to genuine concept learning – only triggering of some sort. Thus the challenge is: supply a theory of cognition which can somehow pass beyond the limits of ordinary compositional systems, and is a candidate for expressive power increase. This seems like a challenge that is next to impossible to meet. This is how I understand Fodor's claim (2008) that it is true and a priori that the whole idea of concept learning is per se confused.

In the rest of this paper I first look at Susan Carey's (2009) response to Fodor's challenge. Then I briefly present Georges Rey's (2012) critique of Carey's views. Finally, I suggest some ways to address Rey's and Fodor's critique and reinstate concept learning roughly along the lines Carey proposed.

Quinian bootstrapping

Susan Carey (2009) makes the following claims about concept acquisition. First, some of our concepts are innate and modular in origin, whereas the majority of our concepts are constructed out of the innate resources and originate from the explicit knowledge systems (roughly, domain general central systems). Second, the newly constructed concepts have more expressive power than the innate system. Third, Carey suggests a mechanism of acquisition for the second set of concepts that is allegedly more powerful than ordinary compositionality based on formal logic. This mechanism is called Quinian bootstrapping (hereafter QBS), and a number of examples of it are supplied throughout Carey's book. The general scheme of QBS is that in trying to understand some new ideas (e.g., fractional numbers, or density as mass per volume), children first form an ordered set of empty placeholders ("mental symbols") which are then gradually filled up with relevant content as a result of analogical reasoning. Empirical evidence for transition from an initial to a more powerful set of concepts involves within-child consistency of performance over a wide range of relevant tasks, and observations that the acquisition of the new set of concepts is difficult. That is, initially children try to assimilate the new terms to their earlier concepts – for instance, they take numerals to be quantifiers of some sort.

Carey's answer to Fodor's argument in particular is that QBS constitutes concept *learning*, because it does not consist in construction from antecedently available concepts using the machinery of compositional semantics alone. The newly bootstrapped concepts are definitional primitives in Carey's view, therefore they cannot arise from logical construction. Carey takes this line of argument to undermine Fodor's claims that (i) all learning mechanisms reduce to hypothesis formation and testing, and that (ii) the relevant hypotheses must be formed in terms of available concepts via compositional semantics. In addition to the details she herself provides, Carey endorses other proposals that primitive concepts can be learned (Margolis, 1999; Margolis & Laurence, 2002).

Nativist objections redrawn

Rey (2012) argues that even though Carey supplies valuable data on how children in fact acquire concepts, she fails to meet Fodor's nativist challenge. This is so because she conflates certain semantic issues, namely how expressive power might increase, with epistemological ones, that is, cognitive accounts of mental representation and its development. In logic, expressive power increases only if new primitives (e.g., operators, predicates) are added to a logical system – primitives which cannot be expressed by combinations of the antecedently available ones. The development of mental representation, on the other hand, includes episodes in which new complexes are formed out of certain innately available primitives. So how could QBS increase the expressive power of mental representational systems?

In addressing this issue, Rey points out an interesting parallel between Quinian bootstrapping and Ramsey sentences. Ramsey sentences are logical formulas that serve to define certain new theoretical terms by specifying their relations to already given old terms. A Ramsey sentence is a huge formula that is a conjunction of all the claims made by some theory. This conjunction involves all the relevant concepts: old ones, and new ones which are to be theoretically defined by the entire formula. The Ramsey sentence contains a unique existential quantification of each of the new terms. For example, on certain varieties of functionalism about the mind, types of mental states are characterized by the relations that they exhibit to other states (mental states, stimuli, and behaviors). Here the old terms are those of stimuli and behaviors; the new ones are those of mental states. For instance, the mental state of hunger is elicited by certain bodily conditions, it tends to evoke thoughts about food and food-seeking, and food-seeking behavior (unless some higher-order motivational states like the desire to lose weight cancel that behavioral effect out). Ramsey sentences could also be formed about theories in other domains of science.

According to Rey, this way of introducing new terms is reminiscent of Quinian bootstrapping. As we have seen, QBS consists in introducing some new set of empty placeholder symbols together with the relations in which they stand to one another, then gradually filling up the placeholders with content. The analogy between Ramsey formalism and QBS may not be perfect, as only the former assumes that the meaning of the newly introduced theoretical terms is exhausted by their relations to other terms. Rey then suggests that even if Ramsey sentences cannot capture the format of mental representation, they can at least capture its content. Mental representation probably does not have the format of Ramsey sentences, but some Ramsey sentences might have content equivalent to conceptual representations in the mind.

Ramsey-sentences can even capture the general type of content-enrichment that arises from locking to new environmental kinds. Simply adding a rigidifying operator (Kaplan, 1978) to the logical devices utilized by Ramsey

sentences would capture the reference-fixing aspect of cognitive architecture. Kaplan's dthat operator has the following interpretation: dthat F := the unique thing that is F in the actual world, but not in all possible worlds, where F is some non-rigid role concept. For example, 'watery stuff' picks out H_2O in the actual world (but not in all possible worlds). 'dthat watery stuff' designates H_2O – the actual filler of the watery-stuff role – in every possible world. This is also the semantic function of Fodorian conceptual primitives like WATER: according to Fodor, the concept WATER refers to the very natural kind that happens to fill the watery stuff role on Earth in our world. Therefore these dthat expressions can be equivalent in content (if not equivalent in format) to referring conceptual primitives. The question now is, may dthat expressions as reference fixers increase the expressive power of a representational system into which they are introduced? Rey notes that this is a purely logico-semantic issue which is crucial for resolving the nativism debate, still empirical evidence concerning concept acquisition appears irrelevant to it.

Rey still acknowledges that some form of QBS, or the introduction of new referring primitives, might increase the host system's expressive power. However, currently we cannot see how this could happen, because Carey's solution cannot adequately handle Fodorian problems of circularity and Goodmanian worries of indeterminacy.[5] Rey's argument for this claim is based on one of Carey's key examples, the acquisition of NATURAL NUMBER. On Carey's account, the crucial step of induction in this process is when the child notices that the numerals name successive sets each of which has one more member than the previous one (Carey, 2009; Rey, 2012). This noticing, however, could not happen without tokening the concept ONE MORE THAN, aka SUCCESSOR, which is the very essence of the concept NATURAL NUMBER. Without tokening SUCCESSOR the child could generalize in a number of other ways when seeing the sets in question, never arriving at the proper meanings of the numerals. Thus Carey's best-elaborated example of Quinian bootstrapping is still subject to both Fodorian and Goodmanian worries.

Rey also supplies some examples to argue that known cases of analogical reasoning (a crucial process in QBS) are subject to the same objections. He says in his footnote 13: "Or consider the bewildering analogy often provided in introductions to General Relativity, in terms of a rubber sheet, whose shape is of course ordinarily deformed by rolling onto it a heavy metal ball. 'The curvature of four-dimensional space-time is just the same,' we're told, 'except that there's no rubber sheet, no gravity and the deformation

occurs in four dimensions'! Analogies may help in causing the *manifestation* of a concept, but it's hard to see how they'd be sufficient for the bringing out the *possession* of one." Thus it seems that nothing short of innately possessing concepts can result in their manifestation. We still cannot see a non-circular account of concept construction that can also handle the inherent indeterminacy in induction.

Getting out of the circle

In this section I propose a slightly amended, non-circular account of bootstrapping SUCCESSOR, trying to save Carey's original account. I shall also point out some ways to handle Goodmanian worries associated with the same concept. Then I suggest one example of analogical reasoning in order to provide an existence proof that analogies play a role in concept learning, and not just triggering. Following these examples, I shall argue that some forms of procedural learning, namely the acquisition of certain skills is necessary for learning new referring concepts, and this kind of learning is essential for increasing expressive power in human minds. Finally, I briefly discuss Fodor's new nativist argument outlined in the Introduction.

Bootstrapping SUCCESSOR

Step 1. Imagine that a child is playing with toy horses and riders; she has a bunch of both, and she is trying to mount exactly one rider on the back of each horse. Two general outcomes are possible: (i) each horse has a rider, and each rider is sitting on a horse (ii) there remain horseless riders, or riderless horses. Suppose that when (i) happens it makes the child happy giving her a feeling like "it's all nice and complete". So (i) is a Good Case. On the other hand, (ii) leaves the child with a mild frustration, as the pairing activity cannot be finished – this is a Bad Case. Thus a Good Case is one where the pairing activity can be completed, and there remain no unpaired objects in either set.

Step 2. Suppose that the child, on carefully observing a Good Case, notices two possible groupings. One is that all members in each group (e.g., horses, riders) look alike; the other is that two different objects (a horse and a rider) constitute a pair. Looking alike is judged on the basis of perceptual similarity; but the immediate question is, does the child need to be born with PAIR, in order to proceed with the second recognition? The answer is no: let us make a little detour to see how PAIR might be bootstrapped.

Here we take for granted something like Margolis and Laurence's account of primitive concept acquisition (Margolis, 1999; Laurence & Margolis, 2002). The first step in bootstrapping PAIR is to take two generic kind-concept frames, and fill into them the two perceptual prototypes (horses and riders, in our case). I take it that such generic concept frames have two placeholders: one for perceptual information (I call this placeholder the P-slot), the other for abstract information, represented by other concepts (A-slot). For any particular concept, these slots may have a varying amount of information in them, from minimal to very rich.

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[5] Fodor's circularity problem has been described above. In specifying the meaning of some concept via a hypothesis, we must understand and use the very concept of which we formulate the hypothesis (Fodor, 1990, 1998). Goodman's problem of induction is that given a body of empirical data, there are infinitely many ways to inductively generalize from it, and learning theories need to explain how we choose our preferred ones (Goodman & Putnam, 1983).

Suppose that in the horses and riders case, the A-slot of both concepts initially contains only the core cognition concept OBJECT. What distinguishes the two concepts is the perceptual information in their P-slots. In order to represent *a particular pair of objects*, the two concepts need to be linked by means of association. In the present case this is based on the fact that the two were manipulated together (one in the child's left hand, the other in the right, etc.). To obtain the generic concept PAIR from context-dependent representations of particular object pairs, we need abstraction which in our case takes the form of feature elimination. While forming representations of different pairs of objects on different occasions, the child notices that there are varying as well as constant features in these representations. That there are two concept frames (i.e., two objects connected in experience) is the constant part; P-slot contents, and the experiences that set up the associative connections may vary. Thus PAIR will be the abstract schema TWO CONNECTED OBJECTS (i.e., two generic kind concept frames linked by association).

We can now return to SUCCESSOR. In *Step 3* the child notices that the Good Cases consist of pairs only, whereas the Bad Cases contain leftover single entities for which pairing cannot be finished. Once again a move of feature elimination is needed: for being a Good Case, the quantity of pairs does not matter. Quantity of pairs may be represented by the analog magnitude system, so there is no threat of circularity: we do not need NATURAL NUMBER to account for GOOD CASE, for instance.

Step 4. Suppose that the child does further experiments with some Good Cases, trying to find out how to turn a Good Case into a bad one. She discovers that adding pairless objects of one of the two kinds will do. She then notes the minimum effort to spoil a Good Case: adding exactly one object (horse or rider, as in our example). The concept ONE is available from set-based quantification, so we have still not closed Fodor's circle.[6] To summarize, the recipe for obtaining SUCCESSOR is this: take a Good Case, spoil it with the minimum effort. Disassemble the pairs; form two groups of the two kinds of objects. Now the kind group that was added an extra item a moment ago is the successor of the other (redo the pairing if you forget which one is which). At the end, MINIMALLY SPOILED GOOD CASE will serve as SUCCESSOR.

Let us now turn to Goodmanian worries. The question is, what cognitive factor is shepherding mental construction in this particular direction, given that there are so many other possible ways to assemble structures from representational primitives? Perhaps the directing forces are the innate concepts PAIR and SUCCESSOR, lurking in the background? That need not be the case. Children's and adults' constructions do in fact proceed in many different directions, forming a lot of representational complexes. There is a lot of search going on in the vast logical space of compositional representation, but many of the constructs are soon dropped as useless – either as a result of social influence, or in an effort to understand what is going on in the environment. Some constructs, however get promoted.

For an example, imagine that Daddy and little Victor are playing a board game. At some point, little Victor wants to know who has more game pieces on the board. As a matter of fact, Daddy has six blue ones, whereas little Victor has eight red ones. Little Victor stubbornly thinks that the proper way to count is 1,2,3,4,2,2,2,2, (repeating 2 *ad infinitum*). He notices that Daddy's set of pieces maps onto 2, and so do his ones, therefore he tentatively concludes that both of them have the same number of pieces. But he also has the impression that the blue and red pieces are different in number. He manages to prove this by pairing them up, producing a Bad Case. Meanwhile, Daddy is vehemently arguing that he is doing his counting in the wrong way, and offers a different system. Now unless little Victor is no smarter than the present prime minister of Hungary, he will quickly realize that something has gone wrong with his system of counting. So he switches to the one proposed by Daddy, and resolves the inconsistency. Very similar stories could be told about learning to play chess, and a number of other cases; note that this solution is quite close to Goodman's original one, namely entrenchment (Goodman & Putnam, 1983).

Analogical reasoning

I declare up front that at present I do not have a bootstrapping story for CURVATURE OF FOUR-DIMENSIONAL SPACE. I can only show, using a much simpler example, that analogical reasoning may indeed be an important means of actually learning, and not just triggering, a new concept. Here is my story. The carburetor was invented by two Hungarians, Donát Bánki, and János Csonka. According to an anecdote, a key step in the process happened when Csonka was walking by a florist in a busy boulevard of Budapest. The lady was using her spray bottle to water her flowers. Csonka saw the event, and immediately realized that that was the way to manage fuel introduction into the cylinders of internal combustion engines (instead of evaporating gasoline by engine heat, as was done in some early motors). This is a fairly simple, yet powerful analogy: the recipe is, replace water by gasoline, and flowers by steel cylinders, and you pretty much got the carburetor. So we can meaningfully claim that *feeding the engine with gas is like using a spray bottle – only there is no spray bottle*.

This solution, however, does not generalize to the concept of four-dimensional space. An important difference between the carburetor and the 4D-space cases is that all by itself the image of a steel ball rolling on a rubber sheet may not give a physics student the crucial insight into the target concept; this image may simply be an initial intuition pump, or even

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[6] Note also that actions like coupling, or noticing what takes minimum effort are pretty close to a sensorimotor vocabulary. I suggest no return to empiricism, still it is worth noticing that sensorimotor activity might play some mediating role in bootstrapping mathematical concepts. To this extent Piaget's view of development may be correct.

just a funny attention-grabber. I presume that a convincing account of how to learn FOUR-DIMENSIONAL SPACE will be much more complex than that of learning CARBURETOR; still we seem to have an existence proof that analogies may contribute to genuine learning.

For another example, why suppose that LIGHT BULB must be innate, given that learners can construct this concept somewhat similarly to how Edison constructed the light bulb itself? It is a matter of accumulating experience to realize that white hot metals may serve as light sources especially if they don't melt, don't burn, and don't set your house on fire. Satisfying these constraints was the result of a long cultural development, and an obvious example of skill acquisition. The crown was put on by the inventor, but he was far from being the only one to contribute. And while the relevant skills are possessed only by some expert workers, the basic principle can be understood by virtually anyone.

Reference and ramsification

Recall Fodor's new argument for nativism, according to which (P1) compositionality cannot increase expressive power, and (P2) expressive power increase is the hallmark of concept learning, therefore (C) from the principle of compositionality no account of concept learning can be derived. What supports this argument – in particular, what supports (P1)? Fodor and Rey suggest the following analogy. Just like in formal logic, where compositionality cannot increase expressive power, in mental representation systems (MRS) combination cannot increase expressive power either. To this analogy the immediate reply is, minds are not exactly like systems of formal logic – not even on Fodor's own view. Next, however, Rey contends that no matter how the format of MRS differs from formal logic, contentwise it can be captured by logical formalism. Now the argument becomes, IF the content of MRS can be captured by logical formalism, AND compositionality in logical formalism cannot increase expressive power, THEN the kind of compositionality that obtains in MRS cannot increase expressive power either, *never mind the differences in format*. This is a giant leap. It needs support, which Rey provides by (i) reiterating the circularity objection and Goodmanian worries, trying to show that they undermine Carey's examples of QBS, and (ii) arguing that not even newly acquired primitive concepts can increase the expressive power of MRS. We have seen that via (i), the general argument leads us back to particular learning accounts: if learning theories can take care of circularity and Goodmanian indeterminacy objections, that will undermine Fodor's and Rey's nativist arguments. In defending (ii), Rey makes two points. First, conceptual role is essential for concept possession; a primitive concept that causally covaries with some environmental kind, but is causally or inferentially detached from other concepts does not increase the expressive power of its host MRS. Second, consider Twin-Earth thought experiments: any denizen of Earth or Twin Earth has the power to represent either XYZ or H_2O, even before one of these substances appears in their environment. In this sense, there is no increase in their mind's expressive power at all.

Here is my response to this argument. Referring is an ability; it is not a logical construct. If you have the ability to refer to Fs, then some mental symbol of yours carries information about Fness. Information carried about Fness is a semantic issue, whereas the mechanism or ability that secures the locking and thereby endows the symbol with content belongs to metasemantics. As such, it is not captured by logical formalism. The distinction between skills or procedural knowledge on the one hand, and factual knowledge on the other, is a familiar idea in philosophy. Putnam (1981) argued that logical formalism can never unambiguously determine its own interpretation. However, the referential grounding of symbols in human minds reduces interpretational indeterminacy. It has also been argued that procedural knowledge does not reduce to factual knowledge captured by logical formalism or statements in natural language (Carroll, 1895; Winch, 1990; see also Lewis, 1990).

Keeping semantics and metasemantics separate is quite important. Metasemantic factors are the sources of mental (representational) content, thus candidates for a source of increasing expressive power. Semantics alone cannot account for the origin of mental content. Metasemantics does that, and a metasemantic account of how mental content arises may well involve psychological mechanisms – for example, skill leaning.

Some examples of perceptuo-motor skills that I have in mind are the following.

(1) *The cultural development of artifacts*. The example of light bulbs above is a case in point: the creation of new artificial kinds comes with the invention of new conceptual primitives.

(2) *Deference*. Learn to communicate with experts, ask for information. Is this ring made of gold or brass? Is that animal an insect or a crustacean? By gaining relevant information, you can ground new concepts.

(3) *Actions*. Learn or invent new types of action, and call them dances, martial arts, singing, etc.

(4) *Theoretical concepts*. This is admittedly the most difficult case, since on current views in philosophy of science theoretical concepts are not introduced by skill learning in the first place. Rather, they are formulated on the basis of earlier theories, and scientists' creativity. For example, scientists first inferred that electrons must exist (an exercise of already possessed inference skills), then they developed methods to detect them (detection of electrons was a newly constructed skill routinely applied later), and not the other way around. I agree that a lot more needs to be said about theoretical concepts to make a skill-based account of concept learning more plausible. One way to address this problem is to develop further the ideas of concept construction supplied above, and applying them to the acquisition of theoretical concepts. The kind of constructivism that I have proposed so far is Piagetian in

spirit, but a possible way to develop it further is to consider certain neoconstructivist approaches (e.g., Johnson, 2009).

In his paper, Rey distinguishes between functioning psychological expressive power, and semantic expressive power; he argues that learning can increase the former, but not the latter. Here is how this distinction is to be understood. Rey thinks that learning and innateness are not incompatible. Hypothesis testing and experience may select from innately specified concepts and hypotheses, similarly Chomsky's principles and parameters view of the acquisition of grammar. Experience may tell us which of the innately available concepts of ours are useful in understanding our environment at many different levels of description, ranging from social to microphysical.

I am defending a view stronger than this one: as I have argued, there exist ways in which even the semantic expressive power of human minds may increase. I agree with Carey that many of our concepts arise in ontogenesis as a result of bootstrapping from experience and a smaller set of innate concepts. Therefore they are not innate in the sense Rey thinks they are. New logical constructions out of antecedently given concepts do not increase expressive power, but *new logical constructions which also contain new referring primitives inexpressible in antecedent vocabulary* do so, at least according to the standards of formal logic. Moreover, as I have argued, skill learning paves the way to learning new referring primitives.

Let me add one more note on the skill-based account presented here. Fodor would say that even if you learn the skill to refer to Fs, this does not entail that you learn the concept F – you may simply trigger an innate concept by learning a skill.

What motivates this distinction between learning the relevant skill whereas only triggering the concept? In Fodor's view, what keeps this distinction compelling is that no particular skill is necessary for possessing the concept F. The criterion of concept possession is locking a mental symbol to its extension, and locking is multiply realizable (Fodor, 1998). Here is my reply. The idea that referring is an ability can easily accommodate multiple realizability: there are many different skills that can ground a given concept. My concept ELM is a deferential one at present, but I could become an expert at recognizing trees in the future. One needs to learn *some* of a range of relevant skills in order to come to possess a particular referring concept.

Finally, note that Fodor's new, expressive-power-based argument for nativism is not nearly an a priori one. As we have seen, this argument takes us straight back to particular theories of concept learning when we check the support for its premises. I think the really serious problems of concept learning remain Fodor's circularity objection, Goodmanian indeterminacy, and Fodor's other question of how concept learning can be anything other than hypothesis formation. Solving these problems takes a lot of work: we need to devise detailed accounts of the acquisition of particular concepts, or types of concepts. But that is just what Susan Carey started doing in her book.

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