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A Deconstruction of Fodor's Anticonstructivism[1]

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Abstract. Fodor has argued against developmental psychology. He contends that most concepts are innate, that little of importance can be learned, and that stage development cannot occur. Fodor considers mental representations to be static *encodings*. He is correct in arguing that new kinds of encodings cannot be learned. Novel encodings are unlearnable however, because encodings are not a coherent foundation for knowledge in the first place. The alternative is a conception of representation as *interactive*. From an interactive standpoint, representation can be explicated coherently, and learning and stage development can be explicated without paradox. To the extent that developmental frameworks equate knowledge with encodings, they will be vulnerable to Fodor's arguments. The alternative is to build consistently interactive models of knowledge and development.

Fodor [1975,1981] has argued against the possibility of any constructivist approach to psychological development. According to Fodor, the standard view of mental representation shared by cognitive psychologists leads to the conclusion that most concepts are innate, that nothing of importance can be learned, and that development through Piagetian stages is impossible. Fodor's arguments are a radical challenge to the entire Piagetian program of explaining development; in fact, they deny the very possibility of a developmental psychology. It is incumbent on developmentalists to answer Fodor's arguments, and when necessary to challenge their presuppositions.

Fodor's arguments all depend on an entrenched, but deeply erroneous, view of mental representation. They depend on the view that mental representations are pictures or encodings of what is represented. The encoding conception of mental representation is fundamentally incoherent

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fact. Fodor has pursued the encoding conception much of the way toward its ultimate breakdown. Fodor [e.g., 1981] often defends his conclusions on the ground that no other conception of mental representation is available· There is, however, an alternative conception of mental representation as *interactive*. The interactive approach to representation [Bickhard, 1980a] avoids the fundamental incoherence of the encoding approach. The interactive approach can explicate learning and stage development without paradox.

Fodor's arguments against the development of encoded representations lead him to a radical form of nativism that is connected, historically and philosophically, to the positions taken by Chomsky [1965, 1975, 1980]. Chomsky too has explicitly rejected Piagetian constructivism [Piattelli-Palmarini, of 1980]. We have found Fodor's arguments much more interesting than Chomsky's, however. Chomsky's nativist arguments focus on specialized innate representations supposedly needed to learn the syntax of natural languages, whereas Fodor's arguments cover mental representations in general. Moreover, Chomsky has never made conceptual arguments for the superiority of his nativist program over a constructivist program; he claims that constructivism must be rejected unless it produces testable models that solve specific empirical problems posed by his description of natural language. A constructivist framework is not obliged to accept these problems as Chomsky has defined them; an interactive framework [Bickhard, 1980b] would be obliged to reject them (see below). By contrast, Fodor has recognized that programmatic positions must be evaluated by conceptual and philosophical arguments.

The Encoding Model of Representation

The encoding model of representation holds that to represent something is to have a picture or encoding of it. Encodings stand in a static one-to-one correspondence with the things that they represent. The problems with the encoding conception are numerous and fundamental.

Skills and Motivation

There are types of knowledge (any sort of skill or know-how) that resist being captured in terms of encodings. Knowledge of how to ride a bicycle or catch a ball cannot be modeled with encodings. Because encodings are static pictures of the world, they have no meaning in themselves - no relevance for the organism's possible actions in the world. If the encodings are to be useful to the organism, an interactively competent agent is needed to interpret them and do something with them (we will argue below that such an agent is capable of knowing the environment interactively, without recourse to encodings). A system of forces external to the encoded knowledge has to be added to solve the 'problem of motivation', i.e., why the organism ever does anything [Bickhard, 1980b].

Incoherence of Foundational Encodings

Not all kinds of knowledge can be modeled with encodings. Encodings, however, cannot be a foundational form of knowledge even in a restricted domain; they must be derivative from some other form of representation. Encodings presuppose knowledge of what the encodings correspond to. In straightforward and unproblematic cases (ciphers, computer codes, and so on), encodings stand in for some other representation.

‘X’ encodes Y means that ‘X’ represents the same thing that ‘Y’ represents. The encoding relationship presupposes that Y already represents something. Y might be an encoding itself, but then it must stand in for some other representation Z. At some point, the regress must terminate, and it cannot terminate with an encoding. If Z is a foundational encoding, it must stand in for something already known, yet Z is supposed to be the means by which that thing is known. Foundational encodings are incoherent: ‘Z represents the same thing that Z represents' is not an explication of representation. Encodings can be derived from some other form of representation, but they cannot be the foundational form of representation in any domain [Bickhard and Richie, 1983; Campbell and Bickhard, 1986].

Impossibility of New Encodings
A direct consequence of the incoherence problem is that genuinely novel encodings are impossible within a strict encoding framework. There is no way to acquire a fundamentally new kind of encoding: the new kind of encoding would have to be defined in terms of the new kind of thing that it represents, yet that kind of thing supposedly cannot be known without the encoding. Genuinely novel encodings are a special case of foundational encodings. The impossibility of foundational encodings rules out an encoding model of knowledge. The impossibility of novel encodings rules out an encoding model of the construction of new knowledge, that is, of development. Advocates of encoding models have tried to circumvent the novel-encoding problem by generating all encodings from a small basic set of primitive encodings by simple rules of combination [e.g., Katz and Fodor, 1963]. In practice, this combinatorial reduction scheme always breaks down. If the basic encodings are sensory qualities, new encodings must be introduced for abstract concepts that cannot be reduced to sensory qualities. Mathematical concepts require a new batch of encodings. Other kinds of encodings have to be posited to account for evaluative concepts. This ad hoc proliferation of primitive encoding types is inevitable, given the incoherence of foundational encodings [Bickhard, 1980b, 1982; Campbell and Bickhard, 1986].

Fodor’s Encodingism

The Breakdown of the Encoding Approach

Encoding approaches typically identify encodings with mental representations in general. Thus Fodor [1975, 1981] refers to encodingism as the ‘representational theory of mind’. Mental representations are encodings of the world (in the form of ‘concepts’ and ‘propositions’). Mental processes are computations that operate on the encoded concepts and propositions. To believe something is to have an internal encoded proposition expressing that belief. Fodor general focuses on the encoded concepts and propositions and their interrelationships with one another. He has much less to say about the computations [Fodor, 1983, 1985]. We have argued that encodingism is incapable of representing skills and that it creates a ‘problem of motivation’. Fodor simply ignores skills and motivation throughout his writings. The assumption that cognition can be detached from motivation is a standard consequence of the encoding approach (we will argue below that separating cognition from motivation is neither tenable nor necessary). A model of knowledge must be able to account for the uses that the organism makes of that knowledge. It is not enough to model dissociated reasoning and ‘fixation of belief.

We have argued that foundational encodes are incoherent, and that in consequence there can be no novel encodings. The impossibility of novel encodings is richly illustrated in Fodor’s work. What Fodor takes as an argument against developmental psychology in general is in fact an argument against basing developmental psychology on an encoding view of representation.

Innateness of Lexical Concepts According to Fodor [1981], all approaches to cognition must posit an innate set of primitive encodings. ‘Empiricist’ approaches adhere to the traditional program of building most encodings out of a small basic set (usually sensory concepts) by applying simple combinatorial processes. ‘Rationalist’ approaches posit a much larger set of innate encodings, not restricted to any particular domain. Fodor is willing to grant that phrasal concepts (corresponding to phrases and sentences) are ‘complex’, that is, built out of basic encodings by logical construction rules. The interesting question for him is whether any lexical concepts are complex. The ‘empiricist’ approach considers most lexical concepts to be complex; the ‘rationalist’ approach does not.

Fodor [1981] argues cogently against the empiricist’ program of generating complex lexical concepts by making simple logical combinations of primitive lexical concepts. For this program to work, it must be possible to decompose complex concepts into simple concepts, and to eliminate the complex concepts in favor of the structures of simple concepts that result. Eliminative definitions, however, do not work in ordinary language. Attempts at eliminative definition (for instance, decomposing *kill* as *cause to become not alive)* are generally vulnerable to counterexamples. There is no evidence from psycholinguistic studies that people decompose ‘complex’ concepts into primitives when they understand sentences [Fodor et al., 1980]. Developmental studies have failed to support the claim that children acquire semantic primitives and then build complex concepts out of primitives [Clark, 1983, pp. 816-820]. And there is no principled basis for selecting the alleged primitives (they cannot be purely sensory, for example). The ‘empiricist’ program of building lexical concepts out of semantic primitives must be rejected.

Fodor [1981] concludes from these arguments that most, if not all, lexical concepts are primitive. Because they are primitive, they must be innate. *Electron, telephone,* and *democracy* must be innate, along with *red* and *loud* and *cause.*

Triggering as a Substitute for Learning

Nothing in this large set of innate encodings prevents all of them from being understood and used simultaneously. Because they are primitive, they cannot be learned. No developmental process can place constraints on how and when they become available. Yet these innate concepts are expressed at different points in the course of development. Many will never be expressed at all in many individuals. Fodor’s [1981] solution to this problem is a mechanism that he calls ‘triggering’. Special conditions are needed to trigger the expression of an innate concept. In some cases, these conditions are sensory. In other cases, the triggering conditions include the prior activation of other innate concepts. Observed developmental sequences in concept acquisition are to be explained by a triggering hierarchy, in which certain concepts must be activated to trigger others. Triggered sequences are nothing like sequences in a constructivist account of development [e.g., Campbell and Richie, 1983]. Knowledge is not build out of prior knowledge in any way. All of the triggered concepts must already be actually (not just potentially) present in the organism. Triggered concepts are not learned in any sense, not logically constructed, just activated.

There are no interesting logical or epistemic relations between triggering and triggered concepts. The triggering hierarchy is purely ad hoc. It is ad hoc in the obvious sense that Fodor has done nothing to specify it. It is ad hoc in the much deeper sense that nothing in Fodor's account of knowledge makes concepts grow or change; encodings just sit there. An extrinsic force has to be introduced to explain away the appearance of conceptual development. Fodor [1981] acknowledges that triggering is not an epistemic process; he claims that it is biological.

Fodor's claim that most lexical concepts must be primitive and therefore innate illustrates the impossibility of novel foundational encodings. It shows how antidevelopmental the encoding approach really is. Primitive concepts waiting to be triggered must be actual states of the knowing system; they are not constructive or learnable states. All of the primitive concepts necessary for advanced mathematics must already have been present in Neanderthal man; the triggering conditions just never came up. The special concepts needed for every future science must be present in all of us now. On Fodor's [1981, 1983] view, the ability to A science presupposes a preformed set of encodings for that science.

I

Impossibility of Stage Development

Fodor rejects concept learning in favor of preformed encodings waiting to be triggered. For similar reasons, he rejects any constructive process of development through qualitatively distinct stages. Fodor [1972, 1980] contended that ascent through the Piagetian stages is impossible in principle. Suppose that each stage is defined structurally: there is a specific formal logic that the child's thought 'embodies' at that stage. Each higher stage embodies a more powerful logic than the previous one. For Fodor, learning (induction') is a form of hypothesis-testing: encoded hypotheses are formulated and 'confirmed'. To ascend from a weaker logic to a stronger one, the child would have to formulate encoded hypotheses in the more powerful logic using only the encoded vocabulary of the weaker logic, and that is impossible. Therefore, stage development cannot occur. There can be no constructive process like Piaget's [1977a] reflective abstraction, or, for that matter, like the much weaker process of accessing [Fodor, 1985, p. 35]. The attack on stage development stems directly Fodor's basic view of knowledge: stage development would require the construction of novel encodings out of old encodings, and that can't happen. The consequence, course, is that all logical capabilities that human beings could ever attain must be innate. Presumably, there are triggering conditions that explain why everyone does not manifest all of these abilities early in life. Given that all logical abilities must be innate in Fodor's framework, and virtually all concepts as well, it is a marvel that human even appear to undergo cognitive development, or that childhood exists at all [Charlesworth, 1986].

Innate Encodings and the Problem of Evolution

Nativism is not a stable position. It is a step toward the final breakdown of the encoding approach. Fodor resorts to nativism because no constructive process in ontogeny could generate novel encoded concepts. Positing innate encodings and innate logical abilities does not solve the problem of how they could originate. It just shifts the burden of constructing the encodings to evolution [Bickhard, 1979, 1980b]. Indeed, Fodor labels his position 'ethological' and claims that the origin and triggering of innate encodings is a biological, not a psychological question. If evolution is essentially a process of variation and selection, however, then Fodor's arguments against encodings being learned are with equal force arguments against encodings evolving. The much expanded time scale of evolution makes no difference, because the argument claims that the acquisition of novel encodings through anything like hypothesis-testing is impossible in principle. Foundational encodings are left without an origin, unless like Descartes we posit supernatural one. The alternative would be to argue that evolution is not a variation and section process, that it has a radically different character. Fodor does not indicate what such an account would be like; he never even asserts that it would be needed. By implication, he treats evolutionary biology as a big unknown, absolutely indeterminate and therefore capable of accounting for anything (Imagine a psychologist who claimed .it didn't matter whether a theory contradicted what was known about physics: 'After all, we don't really know anything about physics. When we do, we'll be able to explain this problem away.' No one would accept such a defense.) The prima facie incompatibility of Fodor's nativism with evolution must be confronted, not brushed aside.

An Alternative to Fodor: The Interactive Model of Representation

Interactive Representation

We have argued that foundational encodings cannot exist, and that encodings must be derivative from another form of representation. That form of representation is interactive [Bickhard, 1980a, b; Bickhard and Richie, 1983; Campbell and Bickhard, 1986].

When a goal-directed system interacts with the environment, the course of the interaction depends both on the organization of the system and the environmental conditions that the system is interacting with. The course of the interaction within the system depends in part on the environment: different environments yield different internal flows of system process. When the interaction is finished, different environments yield different final internal conditions within the system. The possible final states of the system differentiate possible environments: the system will differentiate environments of type A, type B, etc., where A, B, etc., are internal final states of the system. Conversely, a possible final state implicitly defines that class of environments that yields it.

The final states of an interactive system contain information - differentiating information or implicit definitional information - about the environment. This information may be useful for the interactions of other subsystems of the overall system: the internal outcome of one subsystem may differentiate the interactive strategy of another subsystem. Internal outcomes of interactions provide potentially useful information about the environment, and, thus, constitute representations of the environment. Such representations are not encodings, because they do not contain any information about what they represent. They do not represent by structural correspondence with what is represented. The only information about a type A environment that is available in outcome A per se is that the environment is of type A - nothing else about the nature of that environment. Further knowledge about environments of type A takes the form of further uses that the system can make, or learn to make, of outcome A: further representations of the interactive properties of that sort of environment. Interactive representations do not presuppose knowledge of what is represented; hence, interactive representations can be foundational whereas encodings cannot.

For the interactive approach, representation, skill, and motivation are aspects of a goal-directed interactive system, not separate subsystems. To know something interactively is to interact with it successfully according to some goal. Knowledge is the ability to know, constituted in the organization of the system that enables it to engage in knowing interactions. Skill is the potential for success (the goal-reaching aspect) of any goal-directed interactive system. Representation is the differentiating aspect. Motivation, too, is an inherent aspect of an interactive system. Interactive systems are always interacting. The problem of motivation, from the interactive standpoint, is not what makes the system do something rather than nothing, but what makes the system do this rather than that. Motivation is a matter of how the system selects courses of interaction and interactive possibilities. However, selections of goals and subgoals, of strategies and responses, of next steps in the interaction are what constitutes the organization of an interactive knower. Motivation is the selective aspect of an interactive system.

The interactive approach, then, can explicate representation without recourse to foundational encodings, and without divorcing mental representation from skill or from motivation. It is a fundamental alternative the encoding approach, contrary to Fodor's assumption that encodingism is the only possible account of mental representation.

Interactive Learning

Interactive learning is a process for constructing new interactive powers of the knowing system. Learning constructs system organization that succeeds in interacting with the environment, and in differentiating that environment in useful ways. The source of new system organization is internal to the system (there is no way to import structures from the environment). Moreover, the learning process cannot anticipate with certainty which new system organizations will be useful - learning necessarily involves making errors and correcting them. Learning is a process of constructive variation and selection, a process that varies and selects interactive process organizations. Interactivism entails a constructivist account of learning and development.

Learning from the interactive standpoint is fundamentally different from the standard encoding conception. Interactive learning does not operate on elements of representation:

it modifies the organization of the interactive knowing system. Because knowledge and representation are aspects of interactive system organization, the construction of new system organization indirectly constructs new knowledge and new representational capabilities. Interactive learning is hypothesis-testing, but it does not require encoded hypotheses; it selects among hypotheses, but does not ‘confirm’ them. In the encoding view, new encodings have to be constructed out of representational elements (old encodings), which imposes a strict combinatorial constraint on what can be constructed. By contrast, there is no logical bound on the possibilities of new system organization, hence no problem with constructing fundamentally new interactive knowledge. The interactive approach to learning avoids the barrier to new knowledge which Fodor has shown is inherent in the encoding approach.

Interactive Stage Development

The interactive approach is a constructivist approach to development. Moreover, the process by which new interactive knowledge is constructed yields an intrinsically necessary sequence of developmental stages. Basically, an interactive system knows and represents the external environment. However, the knowing system itself has properties that might be useful to know. The level of the system that interacts with the environment cannot directly know itself - knowing is intrinsically irreflexive. That first level can, however be known by a second level that interacts with the first. The second level, in turn, has properties that can be known from a third level, and so on - the sequence is potentially unbounded. The interactive approach generates a sequence of possible levels of knowing, and that sequence constrains development to a corresponding sequence of stages [Bickhard, 1978, 1980a; Campbell and Bickhard, 1986]. The process by which properties of one level of knowing come to be known at the next level is Piaget’s [1977a, b] reflective abstraction.

Interactivism defeats Fodor’s [1972, 1980] argument against stage development in several fundamental ways. What is constructed at the higher knowing levels is new system organization, not encoded representations; encoded hypotheses do not need to be formulated for this construction process to occur. The formal basis for the interactive model [Bickhard, 1980a] shows how the hierarchy of knowing levels, and the increase in logical power from ascending the levels, are not only possible, but mathematically necessary given the analysis of interactive knowing. There is a deep reason for the incompatibility of encodingism with reflective abstraction and developmental stages: reflective abstraction requires that knowing systems have implicit functional properties that could be known by a higher level system. Interactive system organizations have such properties, because knowing and representation are only functional aspects of such organizations. Encodings have no implicit functional properties: they have an explicit representational content, and no other functional properties at all. There is nothing to be known from a higher level that was not already explicit in the encodings. Levels of knowing, and their corresponding stages, cannot be defined in terms of encodings - the whole hierarchy collapses.

The hierarchy of knowing levels affords an explanation of another key aspect of human knowing: consciousness. Consciousness is explicated as the relationship between the first level and the second level of the knowing hierarchy: the second level can examine and change the first level without actually enacting it. The nature of consciousness is never addressed by Fodor, nor by most other encoding theorists. Moreover, the emergence of consciousness in biological evolution is part of a lawful macroevolutionary sequence that includes knowing, learning, and emotions. The interactive approach treats evolution as a variation and selection process that tends toward greater adaptability, not as an indeterminate source of unlearnable encodings [Bickhard, 1980a].

Implications of Fodor's Arguments

Incompatibility of Encodingism with Development

Fodor's arguments are of immense importance for developmental psychology. They establish the impossibility of founding developmental psychology on an encoding conception of knowledge. On the surface, it might appear that only those who accept Chomskyan or Fodorian nativism would be affected. In fact, however, most developmental psychologists are committed to the encoding approach and are thus vulnerable to Fodor's arguments.

Information-Processing Approaches

Information-processing models regard mental processes as computations on an encoded knowledge base. Information-processing modelers are typically interested in questions about processes, e.g., problem-solving heuristics; they do not share Fodor's concentration on the encoded data base. However, even in information-processing models of procedures and procedural learning, foundational encodings abound. In Anderson [1983] production system model, for instance, every production rule has encoded conditions that must be satisfied before production is carried out. Information-processing approaches to development have usually adopted an explicitly combinatorial approach to modeling developmental advances [Kail and Bisanz, 1982; Siegler, 1983· Sternberg and Powell, 1983]. Instead of constructing new kinds of abilities, development combines preexisting unit abilities in simple ways. Fodor's arguments against the combinatorial generation of lexical concepts out of semantic primitives apply with full force against this way of modeling development. The combinatorial process is far too weak to account for interesting development changes. Indeed, Fodor's arguments imply that learning and stage development cannot be explained by any information-processing model, by virtue of its commitment to foundational encodings. None of the proponents of information-processing approaches to development, neither those who are explicit committed to the combinatorial approach nor those who are more sympathetic to constructivism [Chi and Rees, 1983; Klahr 1984], even acknowledge the existence Fodor's arguments.

Anti-Piagetian Approaches

Many developmentalists pursue anti-Piagetian research programs, whose overriding goal is to find earlier and earlier manifestations of abilities described by Piaget. Anti-Piagetians are reluctant to accept anything as evidence that a child does not already understand a key 'concept' like object permanence or number conservation. Some anti-Piagetians [Keil, 1981; Gelman and Baillargeon 1983] openly endorse Fodor's nativist arguments (although they also posit developmental processes, such as accessing, which |Fodor consistently rejects). Other anti-Piagetians [e.g., Siegel, 1978; Trabasso et al., 1978] consider themselves empiricists and normally hostile to Chomskyan nativism. Nevertheless, they characterize what is learned as encoded representations, and specify when and how the abilities that they are studying might originate. By default, they are committed to the position that all important concepts are built in from the start, and so are stuck with Fodor's conclusions.

Piagetian Approaches

Piaget worked to build a constructivist approach to development, and he never accepted innate encodings. In spite of his interactive insights, however, foundational encodings remained as a major part of his framework. Piaget distinguished operative knowledge from figurative knowledge: figurative representations (perception and imagery) are pure encodings. Even operative representations (schemes and structures) behave like encodings: if they are internal re-presentations, they represent by structural correspondence [Bickhard, 1980b, 1982]. In his late work, Piaget [1977b] recognized the need to introduce genuine procedures as a distinct type of representation from operative schemes and structures, but without displacing operative and figurative representations. Piaget's commitment to structures conflicted with his emphasis on developmental processes; reflective abstraction can be defined in terms of knowing-level stages, but not in terms of structural stages [Campbell and Bickhard, 1986]. Structuralism seriously weakened Piaget's own counterarguments to Chomsky and Fodor: he never challenged Chomsky's model of language, which presupposes encoded knowledge [Bickhard. 1980b], and he allowed the debate to become centered on how structures in the environment are imported into the mind, a view of learning and development that only makes sense from an encoding standpoint [Piattelli-Palmarini, 1980].

Need for an Interactive Approach

Fodor has shown that the standard view of representation as encoding is incompatible with a constructivist account of development. If knowledge essentially consists of encodings, there is no way to construct new knowledge - it must be built in. Fodor has elected to keep encodings and reject development. We have argued, however, that the encoding approach is untenable in any case. Foundational encodings are incoherent. The encoding approach is incapable of dealing with skills, motivation, and consciousness. Innate encodings are incapable of evolving for the same reasons that they are unlearnable. Instead of rejecting constructivism, we have recommended rejecting encodings and adopting a conception of representation as interactive. In the interactive framework, representation can be characterized without incoherence, and learning and stage development without paradox. Fodor's anticonstructivist arguments require developmentalists, including Piagetians, to rethink their fundamental assumptions about knowledge. They point to the need for interactive conceptions of knowledge and development to replace bankrupt encoding conceptions. Without intending it, Fodor has done developmental psychology a great service.

Addendum: Molenaar [1986], in a recent issue, argues that if the physical embodiments of representations interact nonlinearly with each other, as would be reasonable to suppose if those embodiments are neural, then those nonlinear interactions may satisfy conditions for the spontaneous emergence of new organizations, following Prigogine. Molenaar suggests that such an organization would constitute a more powerful structure and, therefore, that such a possibility constitutes a counterexample to Fodor's claims.

We would agree that if the physical embodiments of representations satisfy conditions that yield the emergence of new physical organization, then one can expect the emergence of new physical organization. Beyond that conclusion, however, Molenaar's suggestions require further support: (l) The relevance of a physical reorganization to cognitive considerations cannot be simply presupposed, but must be demonstrated. (2) If such new organizations were to have cognitive significance, then arguments are required for why that significance should be expected to be positive or rational. It seems at least as plausible that such spontaneous, physically driven reorganization of cognitive structures would be cognitively disintegrating or psychotically delusional. (3) Even if cognitively positive, why or in what sense should such new organizations be considered more powerful than what preceded them, rather than just new. (4) Since such new organizations are, by Molenaar's definition, new organizations of already present representations, they do not escape Fodor's combinatoric constraint. The new structures are structures of old representations, not foundationally new representations, and we are still left with Fodor's claim that all basic representations must be innate.

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