CHAPTER

4

How Does the Environment Affect the Person?

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It is generally assumed that human beings perceive and understand the world through the senses, and that that epistemic connection with the world occurs via the transmission of information from the world through those senses into a mind. The converse perspective on this same assumption is that the environment influences individuals, both microgenetically and developmentally, via the information that is generated in that environment and transmitted into the minds of those individuals. I contest this standard view of the nature of epistemic contact with the world, and, therefore, also contest the corresponding standard view of how the environment influences behavior and development.

A quick sense that there might be something wrong with both sides of the standard view can be derived from consideration of what is usually taken to be a purely philosophical problem with purely philosophical consequences: the problem of skepticism (Annas & Barnes, 1985; Burnyeat, 1983; Popkin, 1979; Rescher, 1980; Stroud, 1984; Wittgenstein, 1969). Briefly stated, the problem of skepticism arises from the following question: How can we possibly know that our representations of the world are correct? The only answer seems to involve checking those representations against the world to see if they in fact match, but, by assumption, the only epistemic contact we have with the world is via those representations themselves—any such check, therefore, is circular and provides no epistemic ground.

Skepticism is generally relegated to philosophy, and, although philosophers periodically attempt to discredit the skeptical question, no one has in fact

succeeded in solving it. The consensus, however, is that there has to be something wrong with the skeptic's position, because it is clear that we **do** in fact have epistemic knowledge of the world. This presumed invalidation of the question, and, therefore, of the problem, is presupposed with even greater force in psychology—not only must there be something wrong with the question that seems to pose the problem, but it is all just philosophizing anyway and has no relevance to the business of psychology.

Unfortunately, psychology is, among other things, in the business of trying to *understand* epistemic relationships between individuals and the world, and of addressing other relationships that often make strong presuppositions concerning the fact and the nature of such epistemic relationships. Even if we accept the *fact* of such epistemic contact between the individual and the world, our models and our presuppositions commit us to particular conceptions of the *nature* of that epistemic contact: The simple rejection of the skeptical *conclusion* that we do *not* have any such epistemic contact does not suffice to invalidate the relevance of the skeptical *argument* to psychology. In particular, if the standard presuppositions concerning the nature of those epistemic relationships are in fact vulnerable to the skeptic's argument, and if the argument is *not* invalid in itself, then the entire body of work that involves those presuppositions is invalidated. I argue here that (a) the skeptic's problem is one of a class of related problems, all of which are valid and fundamental to the epistemological enterprise; (b) contemporary approaches to epistemology—of, for example, perception, cognition, language, or sociality—are intrinsically incapable of solving or of dissolving these problems; and (c) therefore, approaches that make standard presuppositions concerning these epistemological issues—such as contemporary approaches to understanding the influence of the environment on the behavior and development of the individual—are similarly invalidated. I then wish to outline an approach that is *not* vulnerable to the general class of problems that includes the skeptic's problem, and to explore some of the consequences of this approach to the general problem of the influence of the environment on behavior and development.

THE IMPOSSIBILITY OF ENCODINGISM

The "transmission of information" model rests on a general view of the nature of representation: a view of representation as consisting fundamentally of encodings. In this view, "information" is encoded, transmitted, decoded, and new encodings are generated on the inferential or heuristic basis of other already extant encodings. In other words, information is transmitted—and processed and understood—in the form of encoding representations. My rejection of this view rests on a rejection of the encodingist model of represen-

tation: If representation is *not* fundamentally constituted as encodings, then the transmission view cannot be sustained, and must be changed in unforeseeable ways to accommodate the *non*-encoding character of representation, whatever that may be. I begin, then, with a characterization of encodingism, followed by a further elaboration of its critiques, an alternative model of representation, and an exploration of some consequences.

CHARACTERIZATION OF ENCODINGISM

Three equivalent characterizations of encodings are outlined: encodings as representational stand-ins; encodings as representations defined in terms of what they represent; and encodings as known correspondences with what they represent. The stand-in perspective on encodings is clearest and most paradigmatic. It captures directly the character of such encodings as Morse code or computer code. The basic notion is that an encoding stands-in for some other representation, as, for example, " . . . " stands-in for **"S"** in Morse code, or equivalently for some bit pattern in a computer. Such stand-ins change the form of representation, and thereby allow things to be done with and to representations that would otherwise be impossible or difficult: " . . . " can be sent over a telegraph wire, whereas **"S"** cannot, and the potentialities of bit patterns in computers are myriad. The stand-in relationship can also be defined with respect to *combinations* of other representations, creating, in effect, encoding abbreviations. The critical point for my purposes here is to note that encodings as stand-ins require that the representation(s) that are to be stood-in-for must be already present for the stand-in encoding to be definable. Stand-in encodings *only* change the form of representation, they do not and cannot create new representations (except in the sense of new combinations of representations already present).

The second characterization of encodings is as representational elements defined in terms of what they represent. This is manifested in standard manners of speech such as "This thing, **X** say, represents (encodes) **Y**" where **"Y"** specifies what **"X"** is to represent. This is, in fact, the manner in which most encodings are introduced—they are defined as encodings by specifying what they are to be taken as representing. This view of encodings, however, is just a different perspective on encodings as stand-ins. The defined encoding stands-in for whatever is used to specify what it represents: **"X"** stands in for **"Y."** In other words, to define " **'X'** represents **Y**" requires that **"X"** be already known, that **"Y"** be already known, and that *what "Y" represents be already known* so that **"X"** can be used to represent the same thing as **"Y"**—so that **"X"** can stand-in for **"Y."**

Encodings as known correspondences is still a third perspective. **"X"** encodes **Y** involves an epistemic correspondence between **"X"** and **Y** that is

known to whatever epistemic agent is able to take "X" as an encoding of Y. Such epistemic correspondences can be arbitrarily defined between any "X" and any Y, or the epistemic definition can be based on already existing factual, perhaps even lawful, relationships between "X" and Y. In order to know the correspondence, in order to be able to take "X" as an encoding for Y, whether arbitrary or not, an epistemic agent has to already know both "X" and Y and, perhaps, the nonarbitrary nonepistemic (factual or lawful) relationship between them. In knowing this relationship and what the relationship is with, *specification* of what the relationship is with must itself occur in terms of some representation or another, some "Y," and, with respect to that *specifying* representation, "X" is again a stand-in. All three views of encodings, then, are equivalent: They are just differing perspectives on one underlying form of epistemic relationship.

The correspondence view, however, can be particularly misleading. It is often tempting to consider factual or lawful correspondences to constitute encodings—to constitute epistemic relationships—without explicit consideration of what the relevant epistemic agent is or how it could possibly know of the correspondence at all or what the correspondence is a correspondence with. Neural activity in the retina, for example, is generally in factual correspondence with various properties of the light, and this is labeled an encoding of those properties of the light. DNA base pair triples selectively correspond to particular amino acids in protein construction, and this too is labeled an encoding relationship. Yet, there is no agent in the retina, or neural tract, that knows anything about those light properties. Human beings and other animals have been seeing their environments for millions of years without knowing anything at all about light properties per se. Nevertheless, the encoding story—the sensory transduction story—is the standard account of vision and other sensory processes (Carlson, 1986).

Transduction, in its basic meaning, refers to a transformation of form of energy. Such a transformation will, in general, yield a *factual* correspondence between the two forms of energy and the events associated with them. To simply assume that this *factual* correspondence constitutes an *epistemic* correspondence, as in transduction models of sensory processes, is not only a non sequitur, the incoherence problem shows that it is impossible to validly fill in the argument.

Similarly, DNA base pair triples exert specific effects in a complicated process of protein construction, effects that do in fact differentiate particular amino acids, and, thus, establish a factual correspondence with those amino acids. But there is no epistemic agent involved here at all (or, if one were to contend that there is, it is not specified what it is or how it works), and no epistemic encodings either. Note that the problem here is not with these usages of the term *encoding* per se—semantic arbitrariness certainly allows that—the problem is the easy seductiveness of the invalid equivocation of

treating such *non*epistemic versions of "encodings" as constituting *epistemic* encodings. In the case of the sensory systems, such nonepistemic factual-correspondence transduction "encodings" are at times even considered to be paradigmatic cases of epistemic encodings.

For a slightly different example, consider that we might speak loosely of certain spectral lines in sun light "encoding" various properties of and in the sun. The relevant correspondences are there, and have had to be discovered laboriously over centuries by astronomers and physicists, and, for one of those astronomers or physicists, it might even be true that those spectral lines encode properties of the sun, but it is clear that the encoding relationship, however much it is based on lawful correspondences, is constituted in the scientist's *knowledge* of those correspondences, in the *epistemic* correspondences, not in the mere factual correspondences per se.

A related example is found in computer codes. The sunlight spectral lines example is based on physical law correspondences; computers involve arbitrary designer-specified correspondences. But, in both cases, the correspondences are known, and, therefore, the epistemic encodings exist, only for the scientist, in the first case, and the designer or user in the second. Computers do not represent anything *for themselves* (Bickhard & Terveen, in prep.).

If this general point is correct, that factual correspondences cannot in themselves constitute encoding epistemic correspondences, then much of psychology is in serious trouble. Information about the world is almost universally assumed to enter the mind via the senses, and the senses, in turn, are with very few exceptions considered to be sensory encoding systems. The sense in which they are considered to be encoding systems is based fundamentally on the correspondences between neural activity and environmental properties. If those factual correspondences do not in fact justify the notion of encodings, then psychology offers essentially no alternative model of how the individual can make epistemic contact with its environment. Therefore, it equivalently offers no viable model of how that environment can effect the individual.

I argue this point at an even deeper level. It is not only that the observed correspondences in the sensory systems do not constitute encodings, but that strict encodingism in general, in *any* presumed form or incarnation, is logically incoherent and incapable of performing *any* of the standard epistemic tasks that are ubiquitously assigned to it: perception, cognition, language, and so on. That is, it is not just that the relevant encodings or encoding processes have been misidentified, it is that encodingism is a fatally flawed conception of the nature of representation.

The first part of the complex of arguments for this position has already been presented: skepticism. Encodings require knowledge of what they are to represent, and, at least at a basic level, those encodings are the means

by which we know what they are to represent. Therefore, to check their accuracy, we must check them against what they represent, which means we check them against themselves. This is circular, and provides no check at all.

A second, related, argument has to do not with questions of representational accuracy, but with questions of representational origin. How do we know which encodings to activate, to set up? They are to be set up in correspondence with the world, but what is that correspondence to be a correspondence with? How can we construct a copy of the world before we have our copy of it? (Piaget, 1970) We must already represent the world before we are able to construct our representation of it.

A standard rejoinder to this point would be to claim that the construction process is taken care of automatically in the lawful relationships established by the sensory encodings. But, as discussed earlier, those lawful relationships establish only *factual* correspondences. They do not in themselves constitute epistemic relationships; they do not provide knowledge of what the correspondences are with. Therefore, they are not, in fact, constructions of *encodings* in any epistemic sense. Given a particular sensory neural activity pattern—a purported encoding—what is it that we are to set it up to be an encoding of?

A third consideration in the complex of arguments against encodingism derives from questioning how we are supposed to know what an encoding is *supposed* to represent at all. In standard cases, we know what an encoding is supposed to represent because it has been defined or specified in terms of some other representation—it has been defined as a representational stand-in. Those defining representations, in turn, might similarly be defined in terms of still other representations, and those in terms of still more basic representations, and so on. But this regress must stop at some finite level, and it is at this level that an incoherence is found. At the base level of representations, out of which all other encodings are to be defined, we must have logically independent encodings in the sense of their representational content—knowledge of what they represent—*not* being provided by any other representation. If it were specified by some other representation, then the presumed basic encoding would not be basic. If it is not specified in terms of some other representation, then it has only itself to provide representational content, which leaves us with " **'X'** represents whatever it is that **'X'** represents." This fails to provide **"X"** with any representational content, and, therefore, fails to constitute **"X"** as an encoding representation. A presumed foundational, logically independent, encoding is an impossible—logically incoherent—concept.

The deepest level of explanation for all of these arguments and failures of encodingism has already been adumbrated. Encodings are stand-ins, and stand-ins require representation to be already available to be stood-in for. Encodings are known in terms of what they represent, and knowing what

they are to represent requires prior representation of what they are to represent. Encodings are known correspondences, and known correspondences require prior knowledge of what the correspondences are with. These are all three the same point, just looked at from the three encoding perspectives introduced earlier. The point is that encodings *only* change the form of *already existent* representation. Encodings do not and cannot account for the *emergence* of novel representation out of nonrepresentational ground (Bickhard, in press-a). Clearly, such emergence occurs, both evolutionarily and developmentally, and, therefore, encodingism cannot suffice (Bickhard, 1988; Bickhard & Campbell, 1989; Piaget, 1971, 1985). To presume that encoding can account for the emergence of representation, either evolutionarily or developmentally or microgenetically, is to presume that they can explain what they already presuppose—the existence of representation. This is fundamentally circular (Bickhard, 1982). Skepticism and the origins problem and the incoherence problem are all versions of that basic ontological circularity in any strict encodingism.

The conclusion, of course, is that representation cannot be fundamentally characterized in terms of encodings. There must be some other form of representation that can solve the problem of representational emergence, and avoid the incoherent circularities. Such an alternative model of representation might well force changes in standard notions of how persons know their environments, and, conversely, how environments effect persons.

INTERACTIVISM

Any successful goal-directed interactive system must manifest in its interactions sensitivities to the conditions in which it attempts to reach its goals. In particular, it must differentiate its activities in accordance with appropriate differentiations of its environments. I argue here that this interactive goal-directed "sensitivity," this environmental differentiation, is the foundation of all representation (Bickhard & Richie, 1983), that it is a nonencoding form of representation, and that its emergence out of nonrepresentational phenomena is nonproblematic.

An open system in interaction with its environment will proceed in that interaction in accordance with that environment and with the internal organization of the system. Differing environments can yield identical, differing, or partially overlapping internal courses of activity within that system organization. If the system has two or more potential internal states that it might halt in when the interaction has ended, then those final states, say **A** and **B**, will serve to differentiate the class of potential environments into those that yield final state **A** and those that yield final state **B**. That is, the set of potential final states of an interactive system constitute a set of implicit

categories of potential environments that the system can differentiate actual environments into (Bickhard & Campbell, 1989).

Such differentiations are *not* encodings. There is no stand-in relationship. There is no knowledge of what the differentiation is a differentiation of. There may well be a *factual* correspondence involved with whatever the differentiations are in fact differentiations of, but there is no *knowledge* of the *fact* of such correspondence nor of *what* any such correspondence is *with*. There is simply a system in one of several possible final states. There is no representation of anything about an **A**-type environment, for example, except for the functional sense in which it is different from a **B**-type environment. In other words, differentiation is more primitive than encoding.

Note that if the differentiating interactive system is in fact only passive, with no output, it can still serve a differentiating function, although its differentiating power may in general be limited relative to that of the class of truly interactive systems. For such passive differentiators, the point concerning the possibility of factual correspondences being involved in the differentiations holds just as for active differentiators. Such passive differentiations—perhaps simple energy transductions—that establish factual correspondences, but unknown and unrepresented correspondences, are in fact what are found in the sensory systems of organisms. The construals of perception as being based on sensory encodings, then, involve misinterpretations of the "passive functional differentiations with resultant correspondences" that actually occur at sensory surfaces as constituting *known* or *represented* correspondences, thus encodings. Physiologically identified sensory correspondences help explain why the functional differentiations involved can be useful to the organism—the differentiations are of ecologically useful properties—but their usefulness does not involve representation of what those differentiations are differentiations of. It does not involve sensory encodings (Bickhard, in press-c; Bickhard & Richie, 1983).

Interactive (or passive) differentiation, then, is a potentially useful function that is more primitive than encoding, yet captures at least one of the important properties of representation—differentiation. Furthermore, interactive differentiation is nonproblematic in terms of how it might be accomplished—it is "simply" a functional aspect of the activity of the system—and nonproblematic in terms of how it might emerge—system organization need "simply" to evolve or develop or be designed to serve such a function.

It is not, however, in itself full representation. In particular, the sense in which it is more primitive than encoding is, among others, that it does not involve any representational content. There is no representation of what the differentiations are differentiations of, of what the correspondences are correspondences with. With encodings, the function of differentiation and the content of representation are inseparable: Both must be present in order for either to be present. That is one aspect of the circularities involved in a strict

encodingism. In this interactive model, however, we have the emergence of differentiation *without* representational content. Representational content is not necessary to the function of differentiation. Accounting for the nature and emergence of representational content itself, now perhaps on the basis of noncontentful differentiation, is the next task.

Representational content emerges in the *usefulness* of the differentiations to the rest of the system. It emerges in the potential uses to which those differentiations can be put. In particular, if the differentiating system is a subsystem of a larger goal-directed system, and if that larger system selects—functionally differentiates—its goal-directed activities in part in terms of the prior environmental differentiations of the subsystem, then those subsequent potential selections constitute *predicated properties* of the differentiated categories of environments: they constitute representational content about those environments. If the goal-directed system has goal **G78** active, and the subsystem has differentiated an environment of type **A**, then procedure **P133** may be selected, whereas if an environment of type **B** has been differentiated, then procedure **P22** may be selected. Such internal selection relationships between differentiations and further activities in the service of internal goals constitute representational contents: "**A**-type environments are **P133**-type environments" and "**B**-environments are **P22** environments." These implicit predications can be true or false, and are testable and tested in actually carrying out the interactions. The predications, thus, the representational contents, are implicit in and emergent from the system organization that yields the initial differentiations and that selects further system activity on the basis of those differentiations. Those predications, and, thus, the representational contents, can evolve, develop, or be designed *in terms* of that system organization (Bickhard & Campbell, 1989). The principles of such system organization, out of which representation emerges, are not themselves representational: The problem of emergence is, in the interactive perspective, not circular, and, therefore, is not an aporia.

It is important to note that the *goals* involved in this model of the emergence of representational content are not themselves representational. If they were, then the account *would* involve a circularity. All that is required for this model is that the system have indications of success or failure functionally available—without such indications, there would be no truth or falseness of the indicated interactive properties, and, therefore, no implicit predications. For such functional indications of success and failure, the "goal-directed" subsystem need only be functionally organized so that it "tries again" under some internal—failure—conditions and "proceeds to other interactions" under other internal—success—conditions. *With* such a functional organization, the internal conditions under which the subsystem proceeds to other parts of the system constitute a functional goal for that subsystem—the system keeps trying until those internal conditions obtain, and then it goes on

to other interactions. This notion of goal does not itself circularly require any *epistemic* notions of goal because it is a strictly *internal* and strictly *functional* explication of goal—and, therefore, of goal directedness. It is always possible, of course, that the nonrepresentational functional goal condition will itself involve subsidiary epistemic checks on *represented* conditions in the environment, but any such goal-subsidiary *representations* will themselves have to be emergent in goal-subsidiary *functional organizations* with their own environmental differentiations, implicit definitions, and interactive representational content.

Representations of (properties of) what is being differentiated, therefore, are constructible from *non*representational system organization, and *prior* representation of what is being differentiated is not required in order to construct or accomplish differentiation itself. This model, then, is not subject to the encodingist aporia of emergence, nor the incoherence of encodings, nor the problem of origins. Still further, if the subsystem is in final state **A**, then the system is in an **A**-type environment *tautologically*, and the further functional *predications* are *testable* in terms of further interactions that involve them. The interactive model involves an emergence of representation out of action in such a way that there is an *intrinsic functional* relationship between representation and action, not just an interpretive relationship as with encodings. This yields the consequence that representation *can* be tested in action, unlike encodings, for which there is an arbitrary gulf of interpretation between representation and action. (There is no claim here that such testing yields certainty—interactive knowledge is quite defeasible—only that such testing is possible at all.) Interactive representation is *constituted* as organization of potential interaction: There is no such interpretational chasm. In other words, the interactive model of representation is not subject to the argument of skepticism.

INFLUENCE IN TERMS OF SELECTION PRESSURES

In the standard encoding perspective, representation is constituted as presumed known correspondences with that which is represented. This structural correspondence model of representation invites a notion of the *origins* of those structural correspondences as involving a kind of passive impression from the environment into the mind. This impressing of the forms of the world into the intellect is at least as old as Aristotle (Barnes, 1982; Kahn, 1979; Norman, 1979), and has the classic waxed slate as one of its primary metaphors.

In the interactive view, representation is not constituted as *structural correspondences* with what is known, but, rather, as *functional interactive relationships* with what is known. It might be considered that structural correspondences could be impressed into a passive mind, but the system organizations

that constitute interactive representation could *not* be impressed from the world into the system. Interactivism requires active construction as a model of origins.

Further, representational interactive system organization is the implicit ultimate *goal* of such construction—it is an *accomplishment* that cannot be guaranteed in advance. A presumption of foreknowledge of how to construct successfully representational system organization presupposes what is to be accounted for—knowledge of the interactive properties of the world. Prescience does not exist. Without prescience, system constructions cannot simply anticipate the required system organizations. System construction, then, must have an ultimate character of blind variation constructions and selections in terms of the representational interactive success of those constructions. Learning and development must have the foundational character of variation and selection constructivism (Bickhard, 1988; Bickhard & Campbell, 1989).

A related but somewhat more subtle point derives from applying this same logic to interactions themselves, not just to constructions of interactive systems. Which patterns and heuristics of interaction will succeed in achieving successful interactive differentiations of the environment is, in the absence of prescience, also something that must be tried out, perhaps multiple times, to discover what works. What does not work is selected out; what does work establishes differentiations available for potential further interaction. In fact, evolutionary epistemology—blind variation and selection—is the only possible *non*prescient epistemology, and, in that sense, the only possible non*circular* epistemology, at *any* level: biological evolution, historical development, individual development, or organismic interaction (Bickhard, in preparation; Campbell, 1959, 1974, 1990).

Both interactively and constructively, perceptually and developmentally, the fundamental form of influence from the environment to the person is in terms of relevant selection pressures on the interactions, and, thus, the interactive organizations, of the system. Sensory energy transductions, causal trajectories into the nervous system, and so on, are of epistemic relevance only insofar as they participate in such microgenetic and developmental variation and selection constructions. Microgenetic and developmental selection pressures, correspondingly, replace transduced encodings as the fundamental form of environmental influence on the person.

EXPLORING THE SHIFT FROM ENCODINGS TO SELECTION PRESSURES

This shift from encodings to selection pressures is not just a verbal shift, nor is it a change with limited and local implications and consequences. A carefully developed selection pressure perspective forces at times deep changes on understandings of "familiar" phenomena, and new phenomena become

apparent that are not discernable, or discernable only in dim and distorted manner, in the encodingist perspective.

To begin, I first address the familiar fact that most of our interactions are not unsuccessful, and most of our learning trials are not blind. We do seem to have foreknowledge. There are two parts to the understanding of this: The first has to do with the nature and possibility of such foreknowledge, and the second with the origins of such foreknowledge.

The nature and possibility of such foreknowledge is, in both the microgenetic and the developmental cases, grounded on the massive redundancy of the world. By redundancy is meant the opposite of informational independence: A great many interactive potentialities of the world are *indicated* by the outcomes of other interactions. Visual scans, for example, suffice to indicate multiple complex interactive opportunities afforded by physical surfaces and objects, by other agents, and so on. Similarly, categorization of problems into types can indicate the forms and strategies likely to yield solutions. Neither the interactions indicated by the initial visual scans, nor the problem attempts using strategies and heuristics indicated by the problem categorizations, will be fully blind. They might, in fact, be so familiar and practiced as to seem determinate and certain. Much of our quotidian life involves such familiar, habitualized, and taken for granted foreknowledge of what is possible and what will work.

The origin of such knowledge, however, requires first that those relevant indications of interactive and constructive potentiality be *functional* in the system organization, and that requires that those indications have been *constructed* in that system organization. That construction, in turn, may also involve *prior* heuristic knowledge of problem types and heuristics for solutions, but, at some point (whether developmental or evolutionary) those constructions *cannot* involve such foreknowledge on pain of either circularity or infinite regress. At some point, initial constructions must have been without any foreknowledge, must have been blind.

Similarly, even given the constructed presence of such indications in the system organization, they will be functionally active only if and when the relevant interaction outcomes that evoke or trigger the indication have been reached, and those will have been reached only if the relevant interactions have been attempted. The *capacity* for those relevant interactions will have to have been already constructed, but, more important for present purposes, the *attempts* of those interactions, given the presence of the relevant constructions, might themselves be based on indications from prior interactions, whose potentiality might likewise have been indicated by the outcomes of still further back interactions, and so on. But this regress too must terminate, and at that point of termination, there must be interactions without prior indications—blind attempts at interactions. These blind levels of interactive trials will generally involve microgenetic details of sensory interactions

(e.g., visual interaction differentiations of distance via motion parallax, or of objects and shapes in a cluttered and unclear scene) upon which the vast complex of understood redundant potentialities of our environments are perceptually and apperceptually based (Bickhard, 1980a; Bickhard & Richie, 1983).

The epistemic edge of our knowledge of the world—both of how the world could be in general, and how our current environment actually is—is necessarily grounded in blind variation and selection. The great bulk of our adult world, on the other hand, is constituted as the enormously vast and complex potentialities for further interaction and construction that are indicated for us on the basis of those grounding interactions, that are informationally redundant with those grounding interactions. Conversely, we engage in much of our perceptual and learning experiences for the sake of those redundancy based indications of further potentiality, of what is possible and what might work (Bickhard, 1980a).

This is the replacement level for the simple encoding model: Encodings from the environment are replaced by selection pressures from the environment, operating on foundationally blind variations of microgenetic or developmental constructions. We do not *encode* sensory properties of the world from which we *infer* perceptual and cognitive properties of the world, from which, in turn, we *infer* action potentialities. Instead, we engage in initially blind interactions with the world, seeking those that fit the current selection pressures, on the basis of which the vast complexes of interactive potentialities, interactive affordances, that constitute the interactive world are *directly* indicated (Bickhard & Richie, 1983).

At this simple replacement level, we escape the incoherencies and aporias of encodingism, and understand the emergence and function of representation in the field of action. We also understand the necessity, as well as the actuality, of models of active mind.

IMPLICATIONS AND CONSEQUENCES

Just as constructivism and an active mind are logically forced by the interactive model of representation, however, so also are many additional properties and potentialities. One critically important example derives from noting that the environment can influence the person not only by *imposing* selection pressures, but also by *blocking* selection pressures. The notion of blocking selection pressures, in turn, gives rise to a functional notion of scaffolding.

Scaffolding. Constructions of system organization are subject to selection pressures, and survive only if they are minimally successful in their interactions. Constructions are in the context of already present system, and, in

general, make use of previously constructed organization as the basis for current construction. If the amount of complexity of construction necessary, in the current context, to achieve a *successful* organization relative to the operative selection pressures is too great, then nonprescient constructions are unlikely to happen upon the successful organization. Successful constructions, in other words, tend largely to be "small" additions to and variations on what is already present. If such "small" constructions are not sufficient to satisfy some arena of selection pressures, the system may be unable to achieve success in that arena of selection pressures.

If, however, some of those selection pressures could be *blocked*, then some constructions that would be inadequate with respect to the full array of selection pressures might become adequate with respect to the reduced pressures. Points of constructive success might emerge that were constructively closer to the existing capacities of the system, and, thus, potentially achievable by the constructive processes. If several such constructively accessible points of successful, therefore stable, construction emerge that are constructively close, they may form a *trajectory* of potential construction, each point of which is constructively accessible from the preceding, that ends with an otherwise *not* constructively accessible system organization that is successful and stable with respect to a full domain of selection pressures. That is, the blocking of some selection pressures may allow the system to climb a trajectory of stable constructions and achieve a resultant construction, and, thus, a resultant capability, that it could not have reached without the suspension of those selection pressures. Muting or blocking selection pressures in the service of variation and selection construction is *functional scaffolding:* the generally temporary suspension of selection pressures scaffolds the constructions of capabilities that ultimately do not require that scaffolding (Bickhard, see volume 2).

This conception has much in common with the standard notion of scaffolding in the literature as the provision of knowledge that is not otherwise present in order to make possible accomplishments that are otherwise beyond the capacity of the individual, usually a child. This provided knowledge is postulated to be eventually internalized by the child, and thereafter no longer needs to be provided externally. Such provision of knowledge, for example, in the form of organization and coordination of activities—each of which is within the capacities of the child, but for which those coordinations are not within the capacities of the child—can permit much to be accomplished by the child and scaffolder together that are impossible to the child alone (Bruner, 1975; Vygotsky, 1978; Wertsch, 1985; Wertsch & Stone, 1985). The process of internalization, however, is generally left very unclear, and, by default if not by explicit model, is left to some form of encoding by the child. The model of scaffolding the variation and selection processes for the child offers a nonencoding alternative to this view of internalization.

The most important consequences of this functional notion of scaffolding, however, result from its being much *broader* than "the provision of knowledge that is not present in the child." The muting or blocking of selection pressures *can* be accomplished by the provision of otherwise absent knowledge, but it does not *require* such knowledge.

A deep and powerful example is provided by the function of *self*-scaffolding. This notion makes no sense whatsoever in standard conceptions: How can a child or adult provide to him or herself knowledge that he or she does not already have? I argue, in contrast, that self-scaffolding is an essential class of skills that children develop and even that self-scaffolding constitutes its own *field* of development.

Self-Scaffolding. Scaffolding is the function of reducing the demands of otherwise perhaps too difficult tasks. Those demands—selection pressures—can be blocked, suspended, muted, set aside, compensated, or satisfied by knowledge provided externally. Only the latter version requires knowledge of how to satisfy the relevant selection pressures. From the perspective of one person scaffolding a developmental task for another, this is already broader than the "provision of knowledge" model. For example, much of the scaffolding provided to children in language learning is not the provision of otherwise absent knowledge, but the sometimes multitrial processes of making communications efforts on the part of the child successful that would normally be obscure and unsuccessful. In other words, adults often devote considerable effort to figuring out what a child has in mind.

From the perspective of an individual, including a child, *any* reduction in complexity of a problem, making use of resources that are not intrinsically part of the problem situation, breaking down into subproblems, moving to ideal cases, moving to simpler cases, and so on, is an instance of self-scaffolding. Each provides an instance of reducing the selection pressures on successful construction in the service of ultimately satisfying the full selection pressures.

All of these functions of blocking (or suspending, muting, bracketing, and so on) selection pressures must be served by activities of the scaffolder—someone else or the individuals themselves. These are skills. Some scaffolding and self-scaffolding skills will be general in application, whereas others will be specific to particular problem domains. All such skills must be themselves learned and developed.

Self-scaffolding, then, is a critical aspect of *learning to learn*. It is a field of skills that itself undergoes development. It is a field of development that is itself critical to much, if not most, other development (Bickhard, see volume 2).

Learning the skills and heuristics, and learning the efficacy, of self-scaffolding is itself a potentially complicated and difficult field of development. As a field of development in its own right, the development of self-scaffolding

might itself be scaffolded by caregivers and instructors. Instruction is usually a matter of presenting selection pressure experiences that provide useful redundancies for potential future interaction demands. Good instruction is itself well scaffolded, although it is questionable how often this is to be found in a general context that views memory and cognition as passive recordings of "information." Even better teaching involves a scaffolding of the *self*-scaffolding of the students. This certainly occurs, but it is rare, and its grounds are intuitive and without theoretical base.

The notion of functional scaffolding yields a broader perspective on processes of learning and development, and the influence of the environment in general, and caregivers and instructors in particular, on that development. Scaffolding can take the form of the temporary provision of otherwise absent knowledge, but the blocking of selection pressures can be accomplished in other ways as well. Instruction in general must involve some sort of scaffolding—although the approximative processes of variation and selection constructions are not always well served by the breaking of problems down into subproblems that are then taught piecemeal and in isolation. We certainly do not learn to walk by practicing submovements to perfection and then combining them. Instructional scaffolding usually leaves much to be desired.

The necessity of scaffolding and self-scaffolding and the importance of the scaffolding of self-scaffolding themselves serve as selection pressures on methods of instruction and training and acculturation. Forms of experience that do not in some minimal way satisfy these selection pressures will not succeed in yielding the learning and development and acculturation of the child that is necessary and desired—they will not survive. Conversely, properties of instruction, training, and socialization that in standard views may not be satisfactorily explainable may make quite good sense if understood within the perspective of these selection pressures.

Functional scaffolding not only yields enhanced notions of the demands and possibilities of instruction, it has implications and consequences in other directions as well. For example, child play in part consists of the mutual scaffolding of social interaction between the children involved. Elsewhere I argue that attachment and identification both involve important aspects of self-scaffolding on the part of the child (Bickhard, see volume 2). Many institutions, such as school systems or half-way houses, exist to serve scaffolding functions. Childhood in the broadest sense is a biological and social scaffolding. Later I suggest a fundamentally important role for the creation of "permanent" scaffolds—aids to interaction that are, once constructed, permanently available.

DEVELOPMENTAL CONSTRAINTS

Selection pressures are the proximal form of influence on development and interaction. Not all properties of development and the person, however, can be explained in terms of selection pressures per se: there are *properties and*

patterns of the selection pressures that visit themselves on development and the person via those selection pressures, and that can be explained only in terms of explaining those properties and patterns. One form of such meta-pressure is that of developmental constraints.

Selection pressures can arise from many diverse origins. They can be inherent in an environment, deliberately imposed as in instruction, or emergent in the nature of a task, as when the tasks of instruction and acculturation are themselves subject to the selection pressures of meeting the demands of variation and selection constructive processes—subject to the necessities of minimal forms of scaffolding and the scaffolding of self-scaffolding.

The most directly intuitive form of selection pressure is a directly imposed task from an environment. Direct selection pressure is not the only kind of constraint on development, however, and several others are at least as important and much more subtle. One form of such subtlety is *patternings* among selection pressures themselves. Such patterns impose constraints on the manner, the form, and the sequence in which constructions that satisfy the selection pressures can take place (Campbell & Bickhard, 1989). That is, they impose constraints not only on what is ultimately constructed, but on various aspects of the construction process themselves—such as sequence of subsidiary constructions. In this sense, they are *meta*-selection pressures.

One form of such constraint on development results from dependencies among the basic natures of tasks. For example, algebra must be acquired before calculus can be understood; minimal weapon handling must be accomplished before minimal hunting can be acquired—although much development in such cases will be reciprocal and in tandem. Conversely, errors can be made in assumptions concerning such dependencies: Arithmetic can be taught based on set theory, and calculus can be taught in terms of limit theory, but in neither case is this a necessary dependency.

Another source of constraint on constructions derives from the *processes* of construction themselves. The prime example here is that the variation and selection character of developmental construction itself imposes a constraint: the necessity of adequate scaffolding for development to occur. The necessary "nearbyness" of successful constructions can also yield a modularity of ultimate constructive form, with earlier constructions forming units, modules, for later constructions. Such modularity is not a *logically necessary* constraint, however, in that earlier constructions can also be (and often are) *modified* by later constructions, not just *combined* by later constructions. The modularity constraint, therefore, is a constraint *tendency* that is subject to exceptions.

A related constraint tendency of constructive development derives from the nature of what is being constructed. If a functionally isolated subroutine hierarchy is being constructed, for example, then lower levels of the hierarchy must be functional before higher levels can be functional. Because selection pressures operate with respect to such functionality, lower levels must

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in general be constructed before higher levels. This too, however, is a constraint *tendency,* not a logically necessary constraint.

There are at least two senses in which this tendency is not necessary. First, there is in general no logically necessary reason why any particular selection pressure must be met with a subroutine hierarchy system organization at all, and, even if so, the particulars—the number of levels, the nature of the levels, the principles of differentiation of the levels, and so on—of the hierarchy are still not logically determinate (Campbell & Bickhard, 1986). Second, a given system organization is *not* constructed in context-free isolation, and the context of developmental construction can have powerful consequences. For example, a given subroutine may be nonfunctional in a particular subroutine hierarchy until the lower levels of the hierarchy are available. In a context independent sense, then, that subroutine could not be constructed prior to those lower levels. But that subroutine may well be also functional in some *differing* system context, and *already have been constructed* in that differing context, and, therefore, be available *before* the lower levels of this particular subroutine hierarchy. This could, in turn, have important consequences on which system organizations were constructively nearby to current organizations, and, therefore, on what the ultimate system organization might end up being—it might be quite different, for example, than the subroutine hierarchy of the isolated system. *Context effects can influence constructive trajectories, and, therefore, ultimate system design.* Clearly, other versions of such violations of simple hierarchy are possible.

Levels of Knowing. One crucial constraint on development derives from the nature of the knowing or representing relationship itself. An interactive system can represent properties of its environment. That system itself, however, will instantiate properties that might in turn be worth representing. Those properties can be interacted with, and thereby represented, from a second-order system interacting with the first in the same sense in which the first interacts with the environment. The second level, of course, will also instantiate properties, which can be interactively represented from a third level, which can be interacted with from a fourth level, and so on. The interactive model of representation logically forces an unbounded hierarchy of potential levels of knowing and representation (Bickhard, 1973, 1978, 1980a, 1980b; Campbell & Bickhard, 1986).

Because the interactive model also logically forces a variation and selection constructivism, together the two characteristics force a stage sequence on development: No level of knowing can be constructed without there already being interactive organization at the level below with which it can interact. Therefore, the hierarchy of levels of knowing must be ascended, if at all, in strict sequence.

Note that this hierarchy, and, therefore, this developmental stage sequence,

is intrinsic in the nature of knowing and representation as characteristics of goal-directed interactive systems. It is not dependent on any particulars of system organization, such as subroutine hierarchies, and, therefore, it is a logically forced constraint on development. If the interactive model of representation is correct, then this developmental stage constraint is forced by that ontology of the nature of representation. It is (onto)logically necessary, and admits of no exceptions.

Note also that any subroutine hierarchies that do occur in the constructions of the system occur *within* particular knowing levels. Subroutine levels are levels of control; they are not levels of representational *aboutness.* An indefinite number of subroutine levels can occur within a single knowing level—or, in principle, although not likely in practice, none. Models assuming that subroutine levels, or, at least, *numerologically special* subroutine levels, can serve as knowing levels are common, but mistaken.

The knowing level constraint on development is not itself an influence of the *environment* on the person. It is a constraint that arises out of the nature of knowing per se. Any environmental selection pressures, however, whose satisfaction *requires* ascent through the knowing levels impose the necessity of meeting this constraint as one aspect of satisfaction of those selection pressures. Because the stage constraint applies to *any* domain of development, and because many important representations and understandings require the reflective knowings of higher levels, the stage constraint, in at least its lower stages, will be widely imposed.

Developments that arguably require second or higher knowing levels include Piagetian conservations, notions of necessity, higher forms of role taking, the self and identity, syllogistic and other forms of logical inference, and values (Campbell & Bickhard, 1986). Selection pressures and constructive potentialities in all these domains must satisfy the knowing levels constraint.

Critical Principles. The hierarchy of knowing levels together with the variation and selection constructivism, both forced by the underlying ontology of interactive representation, jointly give rise to still another possibility—one that I argue is of far-reaching consequence and fundamental importance. The basic notion is that the individual can construct not only *satisfiers* of selection pressures, but, in constructing heuristics for further construction, internal interactive *representations* of selection pressures can be constructed. These serve the function of permitting *internal* trials of new constructions without the time and risk and other cost of real world trials.

Still further, such internal selection pressures will themselves constitute a domain of development. Such principles of selection will be subject to development, modification, and rejection on the basis of further interaction.

Now taking the knowing levels into account, it follows that internal selection principles are also subject to the stage hierarchy. In this hierarchy, higher

such principles are *about* lower selection principles, in a representational sense. Higher principles may affirm lower principles (e.g., deepening their ground) or they may infirm lower principles (e.g., restricting their scope). It is possible, in fact, to do both simultaneously.

The selection principles form a subhierarchy within the general knowing levels hierarchy. They serve as the internal sources of selection, of criticism, of potential new constructions. They constitute the individual's knowledge of what sorts of constructions are in error, of what kinds of errors are possible and to be avoided. When expressed, they are the principles by which thought and action are criticized. For this reason, I call them *critical principles* (Bickhard, in press-b, in prep.).

Critical principles form the internal aspect of selection. Critical principles can themselves be criticized, and, thus, they ascend the knowing levels hierarchy. Critical principles constitute knowledge of potential error, in whatever domain. Critical principles frame current functioning of the individual, and constrain future development.

Critical principles themselves constitute an important domain of development, subject to its own constructive, scaffolding, self-scaffolding, instructional, and scaffolding of self-scaffolding functions. In one sense, they constitute an internal scaffolding of the task of development—a muting of external selection pressures via already knowing, defeasibly, what errors to avoid.

I have argued that the development of critical principles constitutes the development of rationality for that individual with respect to whatever domain(s) those critical principles apply (Bickhard, in press-b, in prep.). A potentially rational domain, then, is any in which there are learnable sorts of errors. An actual rational domain is any in which some knowledge of those sorts of errors is functional. The emergence of rationality is an intrinsic tendency of the variation and selection and knowing levels character of interactive thought.

Critical principles do not necessarily function in the same way as we are accustomed to by the dominant encoding models of thoughts as encoded beliefs. For example, some critical principles can function quite well without there ever being rational grounds for *believing* them of *anything*. An example of that would be truth in science. The history of science, in which established theories held for centuries have been overthrown and shown to be false, gives little ground for rational belief that any particular theory is in fact true. Nevertheless, it is possible to establish rational grounds for concluding that particular theories are *false*, and at times even in what sense or senses they are false, and this is itself an advance of science. Truth functions as a critical principle, a principle of selection, even when it is not rational for it to function as a belief (Bickhard, in prep.).

I mention this example to show that the manner in which the environment influences the development of rationality in this sense—and this would

include, for example, logic, mathematics, chess playing, physics, farming, hunter-gathering, and the decision making of nomadic life styles—is not and cannot be well understood from a belief perspective. A dominant encoding-inspired belief perspective on rationality obscures the special character and properties of such phenomena as critical principles, and, thereby, obscures the manner in which rationality is taught and scaffolded and so on (or not) by cultures and institutions. There are other sorts of phenomena obscured as well—for example, a ubiquitous "implicitness" in interaction and development (see Bickhard & Christopher, 1989, for a discussion of implicitness in personality).

As just one example of the kind of difference this can make, consider the following. If the critical principle model of rationality is correct, then knowledge of what sorts of errors can be made, and of how to try to avoid them will be among the most important to teach and scaffold. Yet this is not, in contemporary Western culture, a focus of education. Further, a primary source of such "negative" knowledge of kinds of errors is the *history* of a rational field—the errors that were actually made and the subsequent discovery of them to be errors. Nevertheless, a historical approach to educational domains is rare. The possibility of such a critical-principle rationality function for oral histories, literatures, and mythologies is underappreciated.

Critical principles frame rational thought. Knowledge of how to constructively attempt to satisfy them constitutes most of rational ability. Making use of such aids in learning and development constitutes yet another example of scaffolding. These scaffolds, however—although subject to criticism and change themselves, and although no longer directly functional for a construction that has succeeded in satisfying them—nevertheless are not set aside. They are not temporary, but themselves constitute the developmental fields of rationality.

Critical principles are intrinsically *historical* in the sense that they are self-applicable, and intrinsically develop from their own affirmations and infirmations. For any developed domain, the most important arena of that history is that of the society and culture in which the individual is being formed, because no isolated individual can capture the time and the scope available in those histories. Similarly, the development of critical principles is largely *social* in nature, because the most important arena of criticism of thought and critical principles is itself social. The selection pressures of other ideas and reasonings, critical argument, are maximal pressures for and encouragements of the development of rationality. This implication of the theory is consistent with the cultures of the most important flowerings of thought and creativity, for example, ancient Greece (Annas, 1986), post-Chou China (Reischauer & Fairbank, 1960; Schwartz, 1985), the Renaissance (Breisach, 1973; Moote, 1970; New, 1969), turn of the century Vienna (Janik & Toulmin, 1973; Schorske, 1980; Smith, 1987), and so on.

CONSTITUTIVE INFLUENCES

Selection pressures determine success and failure, acceptability and unacceptability, of interactions and constructions. Constraints impose organization and pattern on the satisfiers of those pressures and on their constructions. A converse perspective on the satisfaction of selection pressures emphasizes that the construction of a satisfier of selection pressures is the construction of something *new* in the system. Commonly, this will be a new particular of a general kind that already exists (e.g., a new problem-solving heuristic). But in some cases this will result in the emergence of fundamentally new ontologies, with novel properties. The construction of critical principles is one example.

There is one special case in which the constructions satisfying relevant selection pressures and constraints result in a very special ontological emergence—the social person. Understanding the nature and emergence of personhood is fundamental to the theoretical understanding of all cultures and societies, and of the persons in them.

Personhood exemplifies an ontology that not only owes its constructive *origin* to relevant selection pressures, but also owes its functional *nature* and continued functional *existence* to the sources of those same selection pressures. Social realities impose pressures to be able to interact with them, and becoming able to interact with them *is* becoming a social person. The influence relationships between society and persons, then, include not only selection pressures, scaffoldings, and constraints, and the emergence of new ontologies, they also include the determination of what a person *is* in that culture and the possibility and the resources for becoming and being such a person. The influence of society and culture on personhood is *constitutive*.

Social Reality and Social Development. The existence of social and cultural realities poses difficult theoretical problems. Fundamentally, what is the nature, the ontology of such social realities, and how do they influence persons? As adumbrated, this involves a form of influence not only on what persons do and think, but a constitutive influence on what persons *are*.

Note first that accomplishment of social interactions is a task of potentially enormous complexity. Interactions involving other agents pose difficult epistemological problems. How is anyone to know what sorts of interactions are potential and what the constraints of such interactions are? The epistemically purest form of this question poses it in terms of the social "other" being an unknown agent. The quickest answer is, of course, that we know on the basis of multitudinous indications of body, dress, gesture, location, and language—on the basis of the redundancies available, just like any other apperception of a situation. But that only moves the epistemic question back one step: How do we know what all these things mean? How do we know the relevant redundancies? It also highlights the interesting question of why we need them.

The first critical point here is that the redundancies available with respect to other agents are *variable*—in terms of agents' intentions, moods, beliefs, expectations, and so on—in ways that nonagent redundancies are not. The second critical point is that the redundancies of dress, gesture, language, and so on, are themselves *constructed* redundancies, unlike those for rocks, trees, and furniture. They are not intrinsic to being an agent per se. There is a reflexivity involved in this variable constructiveness that is both ontologically and epistemologically unique to situations with other agents: social situations.

I do not develop the arguments here. But the general conclusion that is drawn is that any social encounter constitutes a problem of cooperation, of coordination (Bickhard, 1980a). A problem of what sort of situation "this" is supposed to be. It turns out that the problem has a complex intrinsically reflexive organization—for example, the nature of the situation for one party to it depends on how the other party takes it, but how the other party construes the situation depends on how he or she takes the first party to characterize it, and so on. Escaping such occasionally dizzying iterations requires powerful tools.

In effect, it requires a scaffolding of the situation for the parties involved in order to achieve successful interactions in the face of the unbounded uncertainties of the sorts of iterations mentioned above. I call such scaffolds *situation conventions*—conventions concerning what the situation is—and argue that they form the emergence of social realities out of individual level realities (Bickhard, 1980a).

Situation conventions are basically commonalities of assumption among the participants to a situation about what sort of an interactive situation the participants are jointly constituting. That *commonality of assumption* about what the social situation is is what constitutes the social situation. Situation conventions collectively *constitute* social reality, and, as scaffolds, are *permanent*. They enable and they constrain social interaction by charting, and, at times, exploiting, the unknownness of raw encounter with another agent. Their permanence is a consequence of the unboundedness of the epistemologically raw social encounter in that that *unbounded* problem *cannot* be solved in itself—*only* the scaffolded social situation is interactively tractable.

Situation conventions are related to contemporary notions of convention, the symbolic interactionist's definition of the situation, Goffman's frames, the ethnomethodologist's reflexivities, and so on (Bickhard, 1980a). The theoretical notion of situation convention, however, is broader than those.

Situation conventions are scaffolds of social interaction. They permit and guide interaction that would otherwise be pragmatically impossible. They also, however, are a level of reality, of ontology, in themselves. They constitute the organization of society and culture and thought within which the individual moves, acts, and develops. Because the individual *is* his or her interacting with the world—his or her resources for such interactions—and

because much of that world is constituted at this level of social ontology, much of what constitutes the *person* will be afforded and provided and constrained by the possibilities available in the situation conventions of the society in which the individual develops. These include the skills (Rogoff, 1989), the notions of roles and institutions (Berger & Luckmann, 1966), the values, the ideologies and legitimations and myths (Berger & Luckmann, 1966), the social and historically developed emotions (Harré, 1986), the various styles of relating, and the particular families and relationships that participate in the constitution of the person. A person is *not* a context independent agent who merely acts in social and cultural contexts, but is rather *constituted* in terms of his or her potentialities for acting and interacting, and those potentialities of interaction exist largely in terms of the social and cultural realities in which they participate (Geertz, 1973, 1983; Harré, 1984; Shweder & LeVine, 1984).

One of the most powerful influences of the environment on the person, then, is that it is the cultural environment that determines what a person in that culture *is*. This constitutive influence exists in two senses: constructive and interactive. Constructively, *learning to engage* in the simpler social interactions of childhood provides the scaffolded resources for the eventual construction of the adult social person. Interactively, the person is *being* social insofar as he or she is interacting with or within those social realities. A social person, then, is constituted as an entity that is capable of interacting with, thus participating in—thus jointly constituting—social realities: The constitution of a social person is the ability to constitute social realities.

What social realities are, and, therefore, what persons are, will vary with culture and history. Personhood, in being a socially constituted constructive emergent, is itself a social and historical ontology. What persons are, and what persons can be, evolve and change socially and historically.

Still another form of emergent constraint arises here. Societies must solve the problem of generations: They must nurture the constructive emergence of new persons as constitutive participants of themselves. They must generate new members in order to continue. There is an inherent dynamic in this process of socialization that plays its own function in history, and an inherent set of constraints in that dynamic. In particular, societies must be constituted in ways that are scaffoldable and scaffolded for their new generations. The task of becoming an adult member of a society is paradigmatically one that is *not* solvable with one massive construction. Societies must have inherent in them both the possibilities and the actualities of decomposition into simpler modules, trajectories of successive approximations to satisfactory competence, tolerance of initially incompetent trials, and so on. Conversely, societies cannot deviate from such properties to too great a degree. For example, they cannot require excessive unlearning and relearning in moving from childhood to adulthood, or impose grossly inconsistent characterizations of the world and its rationales (Berger & Luckmann, 1966).

Language. The situation conventions of society constitute a major domain of interaction. Situation conventions are themselves participants in the hierarchy of reflections of the knowing levels. In particular, it is possible for some situation conventions to provide possibilities for interacting with, of operating upon, other situation conventions. All human societies, in fact, provide powerful institutionalized conventions for such social reality interactions. Elsewhere, I argue that such institutionalized conventions for operating on social realities constitute language (Bickhard, 1980a, 1987; Bickhard & Campbell, in press).

Language, then, constitutes the primary means for introducing, creating, and transforming social realities. In terms of the opportunities for and constraints on further language interactions—for further conversation—language also constitutes much of most of the social realities on which it interacts. Insofar as the person is largely social, it follows that the person is largely constituted at a level of language. Language not only influences the person in particular interactions, language developmentally influences the person by *constituting* the person.

This is similar to the position of the hermeneuticists (Gadamer, 1975; Heidegger, 1962; Warnke, 1987). It differs, however, in that the ground for the emergence of such social and linguistic realities, and of the persons constituting and partially constituted by them, remains itself *non*linguistic. The limits, the horizons, of the world are *not* bounded solely by language. The ground remains that of a general agent interacting with an environment that is not necessarily all linguistically, socially, constituted. Language is largely constitutive, but is not fully constitutive, of either a person or that person's world; language *and* persons are emergent out of nonlinguistic reality (Bickhard, 1987; Campbell & Bickhard, 1986).

Language, then, provides and constrains much of the opportunities for becoming a person. Language is its own domain of interaction and of development, intimately and constitutively related to social development, and, therefore, to person development. Conversely, in a manner that is now becoming familiar, language must be scaffoldable and scaffolded. It must satisfy the constraints of being able to create a new generation of constitutive and constituted participants in that language.

Note that the microgenesis of language cannot be the standard view of the encoding of mental contents, their emission and transmission to an audience, and their decoding by that audience. Utterances, like any other objects of perception, cannot be encoded into the nervous system, there to be decoded into meanings and understandings. Utterances are *interactions with* social realities, and language understanding is a matter of interactive perception and apperception of the indications of utterances *for* those social realities (Bickhard, 1980a).

Utterances, then—no more than anything else—do not influence the person

via the transmission of encoded information. For many considerations, this encoding transmission model seems to be adequate, just as the phlogiston theory of fire is consistent with many chemical interactions, but it cannot be ultimately correct. The incoherence of encodingism makes an encodingist model of language impossible.

The sense in which utterances are understood not by a process of decoding, but by an intrinsically variation and selection process of interactions and apperceptions, just as for other "perceptual" processes, is often not directly evident. Much adult language understanding is of the well-practiced and habituated variety that needs only an initial satisfactory interactive trial to be able to complete the interaction—it appears to be algorithmic. But the underlying variation and selection realities show up whenever language understanding is difficult. Such difficulty can be manifested, for example, in attempting a garden path or ambiguous sentence, or a difficult text, understanding a person in psychotherapy, or learning a language as a child. In all such cases, understanding proceeds, not algorithmically, but with trials and errors, and shifts of considerations among various aspects of the text, attempting to find an interpretation, an understanding, that satisfies the selection pressures of the words, the sentences, the text, the persons, and the context. This process has come to be called the *hermeneutic circle* (Gadamer, 1975; Heidegger, 1962).

The standard encoding view utterly obscures this process. Correspondingly, it makes it difficult to understand the processes of language acquisition in children and the processes of instruction, training, modeling, socialization, and acculturation of children, among other things (e.g., it makes it essentially impossible to understand the development of personality and psychopathology, and the processes of psychotherapy, Bickhard, 1989a, 1989b; Bickhard & Christopher, 1989). For example, the "hypothesis testing" of children in language acquisition is intrinsic, not ad hoc, from the variation and selection view. Similarly, children's creative usages of language are not just errors or mysteries, but are again intrinsically to be expected when viewing utterances as operators—Wittgenstein's tools (Bickhard, 1987)—and considering what a child could be expected to do when attempting an utterance-operator for which he or she does not have a standard vocabulary, a standard tool (e.g., "I'm souping," or "Will you chocolate my milk?" or "I can button it." [turn on a pocket calculator]; Clark, 1982). It is the social operatory version of using a wrench as a hammer because there is no hammer available—children's linguistic tool boxes are limited. Further, the success of such "errors" in communicating is likewise a mystery from the encoding perspective, as is most metaphor and other creative language, whereas, in considering language understanding as a hermeneutic context-embedded constructive process, the in-principle mystery of creative language disappears, even though the complexity remains: The words and sentences are used to

evoke a transformation of the social situation, of the commonality of understanding, and to constrain—to differentiate and discriminate, *to impose selection pressures on*—what that transformation of socially common understanding might be. Creative language also provides examples of microgenetic scaffolding: A sentence, perhaps of a poem, for example, that might be impossible to understand in isolation can in context have appropriate "understanding sets" already available from earlier parts of the context such that the interpretation required to understand in context is no longer constructively unattainable.

The potentialities for language activity constitute much of social reality and much of human reality. The encoding view captures at best only the most ordinary and instrumental, nonconstitutive, aspects of that. Language is the source and the means of the most important influences of the environment on the person. It will not be understood within dominant contemporary perspectives. Among others, neither the operative character of utterances nor the hermeneutic character of language understanding makes sense from within an encoding perspective.

CONCLUSION

The primary attempt of this chapter has been to evoke a sense of dis-ease concerning standard perspectives on representation, and, therefore, on perception, cognition, and language as well. Correspondingly, standard perspectives on the nature and manner of the influence of the environment on the person are brought into question.

An alternative model of the nature of representation is presented, and shown to avoid the logical inadequacies of encodingism. This interactive alternative not only provides coherent accounts of phenomena that are addressed by, but, nevertheless, constitute aporia for, encodingism, it also yields new phenomena and new models that cannot be understood, or at best can be given ad hoc approaches, within the encodingist perspective. These include the imposition of selection pressures, instruction as a deliberate exploitation of redundancies, functional scaffolding, self-scaffolding, developmental constraints, levels of knowing, rationality and critical principles, situation conventions, constitutive influences on personhood, and the operative and hermeneutic character of language.

Presupposition of the encodingist perspective seduces the investigation of the influence of the environment on the person to focus on the imagined details of the encoding and decoding processes, and of the supposed contents that are being encoded and decoded. I hope that, at a minimum, this chapter has indicated that the encodingist presupposition cannot be simply taken for granted, and that the *processes* of environmental influence, not just

the contents, are of fascinating and fundamentally important complexity. Still further, I hope to have offered an approach and a framework for a coherent theoretical understanding of the influence of the environment on the person.

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