Science and Common Sense: A Reply to Atran

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highly inclusive folk-botanical categories. They also exhibit the traditional marked bias against evidence for the intrusion of practical inference into folk-biological thought. Such an approach therefore deemphasizes research into categories having economic importance to people, so we learn less about relationships between food production and folk-botanical thought. In any case, as an analytic category, the "life form" must be regarded with skepticism until, in a range of non-European languages, the prototypic attributes of highly inclusive botanical categories have been shown by interviewing to be exclusively perceptual.

Notes

[1]A referee for this paper suggests that the examples one gets from this methodology may actually be salient rather than exemplary, because informants may never have thought about such a question before. Sinama informants were not asked about the most frequently encountered or conspicuous plants, but about good examples. They did not appear to have difficulty answering and certainly did not single out the most salient. Common "palms" and "birds" (such as coconuts, crows, and ducks) were not considered good examples, nor were conspicuous plants and fish (such as mushrooms, datura, and clown fish).

[2]Forestry experts do not consider most willows *(Salix)* to be trees. In a widely used tree identification book, we find, "More than 100 species (of willow) are native to North America. Most are shrubs, but about 40 species attain tree size" (Brockman 1968:76). Even those species that can attain tree size usually do not, and have several trunks (1968:76–82). In the eastern United States, weeping willow trees are common landscape plantings, so many people probably think they are typical willows. Some English speakers think that exemplary willows are trees, and that pussy willows are not willows; others probably think that pussy willows are bushes and are exemplary willows; and still others probably realize the genus is morphologically diverse.

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Science and Common Sense: A Reply to Atran

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Scott Atran's critique (*AA* 87:298–315, 1985) of contemporary theories of folk-biological classification in general and of my "perceptual model" in particular (Hunn 1976) deserves a response. Atran's goal is to "provide ethnobiologists with a more correct appreciation of the logical and psychological nature of folk taxonomy" (p. 299). I applaud this goal but find Atran's effort here not entirely successful.

He criticizes ethnobiologists (specifically, Berlin, Hunn, and Brown) for "borrowing [in-

valid] analytical schema from their anthropologically ill-informed colleagues in systematics" (p. 299), interpretations he characterizes as "empirically reductionist, and logically confused" (p. 299). He cites three major faults of current theory: (1) "No distinction is made between meaning ["logical inferences involved in classification"] and reference ["perceptual strategies involved in identification"]" (p. 299). (2) "Semantics of categorically distinct phenomenal domains are conflated," referring especially to the psychologist E. Rosch's (1978) generalization of the notion of folk generic taxa as basic object level concepts which are attributed to artifactual as well as folk-biological domains. And (3) "scientific concepts are assumed without warrant" to be relevant to understanding "commonsense notions of the everyday (phenomenal) world" (p. 299).

Let me address each point in turn. First, I agree that it is important to distinguish identification from classification (involving "definition") and both from encyclopedic knowledge (employed in "description"). In fact, I stressed the same distinction in an early working paper (Hunn 1975). However, Atran's assertion that definitions of folk-biological taxa "pertain only to the essences of kinds [their "virtual natures"], not the actual appearance of their denotata" (p. 301) raises questions that Atran fails to answer. Where do these "essences" come from if not from the observers' perceptual experience of denotata? Atran argues that pine trees have cones *by nature* whether or not a given pine exhibits this feature. Granted. However, folk taxonomists come to include "having cones" as part of the definition of "pine tree" as a result of their perception that most pines at some point in their careers indeed produce cones. Furthermore, the "virtual nature" of a concept such as "pine" is open to modification on the basis of additional experience. The possibility of encountering a truly coneless pine cannot be ruled out a priori. Thus "cones" are an empirically contingent feature of "pineness." Cones are not "logically necessary conditions" of a tree being a pine, and thus folk generic taxa (such as "pine") are not "just as 'deductive' as life forms," as Atran asserts (p. 303).

This point is relevant as well to Atran's second criticism. He argues that folk-biological concepts, whether of generic or life form rank, are defined by their "essences" while artifactual concepts, such as "chair" or "table," lack "an underlying nature" and thus cannot be compared directly to folk-biological taxa, as Rosch has done. I do not entirely agree. The perceptual reality of folk-biological taxa—as Atran and I both recognize—is ultimately due to the fact that individuals of phylogenetically real groupings share a *genetic* essence. However, artifacts of a given type share a *cultural* essence, that is, they reflect the mental plans of their makers. Thus "having four legs" may not be of the essence of "table" but "having a flat surface" might, as that is essential to a table functioning as such. Nevertheless, I agree with Atran that the phenomenal reality beneath folk-biological classification does exhibit unique features that demand special theoretical considerations. Most notably, a transitive hierarchy (however shallow) is to be expected in the classification of flora and fauna, as I proved in my perceptual theory (Hunn 1976:522–523), while "artifactual concepts generally do *not* support transitive judgments" (p. 304).

Atran's third criticism hinges on his assertion that "science and common sense constitute logically independent approaches to knowledge." This is the basis of his claim that folk-biological life forms are just as "natural" as folk generics, despite the scientists' rejection of such concepts as "tree," "shrub," "vine," and "herb" as artificial and unnatural and thus an impediment to taxonomic order. Nevertheless, he concludes by granting that life forms (such as "tree," etc.) exhibit a fundamental logical difference from generics (such as "pine" and "oak"). In fact, he notes that "much of the history of taxonomy, from Aristotle to Linnaeus, is an (unsuccessful) attempt to reconcile the divisional character of life forms [which partition the domain by reference to features "positive and opposed" of a single or a small set of dimensions] with the relational character of generics [which segregate organisms "into well-formed configurations"]" (p. 308). It is precisely this contrast that I attempted to characterize in terms of the coordinated distinctions: natural versus artificial, polythetic versus monothetic, and general purpose versus special purpose (Hunn 1976, 1982). Atran does not like my choice of terms. He argues that a folk taxon, whether generic or life form, is neither *natural* nor *general purpose* because "there is no 'logically natural' classification" (p. 305) and because "there is no logical limit to the discovery of new uses [for any given category]" (p. 305). This opinion is asserted but not demonstrated, and I cannot agree. The category "oak" or "pine," by virtue of the fact that it mirrors an extremely multiplex underlying genetic essence, assures that individual oaks or pines will be similar in many useful ways not apparent at first blush (Hunn 1982). Their categor-

ical utility is "general" or open-ended in a way that is not true of an artificial category such as "purple-leaved shrub," a monothetic and "deductive" category relevant to the special purpose of selecting ornamental plantings. Science and common sense agree on the special value of such categories as "pine" and "oak," which is evidence of their "naturalness." This naturalness is less logical than psychobiological, another point of agreement between Atran and myself. In short, I believe our disagreements—so starkly put by Atran—are more semantic than substantive.

One final point. I have argued that some life forms, particularly "tree," "shrub," "vine," and "herb" among plants and "mammal" and "wug" (see Brown 1979:791) among animals are artificial. However, I also argued that the life forms "grass," "bird," "fish," and "snake," by contrast, may be natural categories of the same psychological type as the folk generics (Randall and Hunn 1984). Clearly, the latter are categories of scientific taxonomic relevance and are characterized, to a greater or lesser degree, by the "configurational integrity" we expect of folk generics. Clearly also, "herb," "mammal," and "wug," as normally instantiated, have a residual quality that is quite the opposite of "configurational integrity," and so are neither logically nor biologically natural. However, I wish to revise my earlier published views on the life form "tree." As Brown has shown (1977) this is normally the first life form to be named and thus, by implication, the most salient, and thus in a sense, the most "natural." "Tree" has no standing in scientific taxonomy nor is it set off from other life forms by a "natural discontinuity" (contra Brown 1984:9). Perhaps we should recognize an intermediate category of concepts that lack the configurational integrity enhanced by natural discontinuities characteristic of folk generics but that are nevertheless perceptually compelling. "Tree" is such a concept. The archetypical tree is not only large and woody, but also exhibits a characteristic symmetry, a single trunk with a crown of branches and twigs that supports a canopy of leaves designed to most effectively capture the incident sunlight. Though plants vary continuously in terms of size, woodiness, and multiplicity of stems with no discontinuity between "tree," "shrub," and "herb," there is a strong expectation—evident to careful observers everywhere—that the larger the plant the more woody and less the likelihood of basal divisions of the central axis. These and other regularities in our experience of "trees" can best be explained by biomechanical principles that govern the architecture of large plants (nutrient transport against the force of gravity, resistance to wind, etc., see Stevens 1974, Tomlinson 1983). The configurational integrity of "tree" is not due to phylogenetic relatedness but to evolutionary convergence in response to common adaptive challenges constrained by laws of form. Just as dolphins strongly (if superficially) resemble fish and bats birds (and animal life forms frequently include both), so also do trees of divergent phylogenetic lines exhibit a perceptually compelling, repetitive pattern. Add the fact that woody plants produce wood, a useful substance in all cultures, and it is not hard to understand why folk biologists nearly everywhere are motivated to give trees nomenclatural recognition.

In sum, it is natural for folk biologists to recognize life form categories, but the underlying reasons are various. Some life forms are natural in the strong sense of respecting natural discontinuities. These are "inductive" in the technical sense of my perceptual model (Hunn 1976:518). Others, such as "tree," are natural in the more limited sense of reflecting the coherent pattern of a small set of highly visible features that co-vary without discontinuity. The remainder provide labels for residual regions of the domain, thus characterizing a *fundamentum divisionis* at the life form rank. The fundamental diversity of life forms as psychological constructs contrasts sharply with the homogeneity of folk generic concepts. Thus, it is misleading to gloss over these differences as Atran does in defense of his just claim that life forms "are 'natural' to the human mind as it partakes of the activities of ordinary life" (p. 311).

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The Essence of Folkbiology: A Reply to Randall and Hunn

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The basic issue from which others flow is this: (1) whether there are domain-specific cognitive universals that account for the peculiar kinds of regularities apparent in folk-biological classifications world-over; or (2) whether those regularities are the product of general processing mechanisms that cross such domains as living kinds and artifacts. To claim living kinds are everywhere *ranked* into transitively structured taxonomies, with no other natural domain so structured, favors (1).

Randall plainly opts for (2). The general idea is that categorizing natural objects centers upon prototypes. Furthermore, the perceptual nature of prototypes as well as the somewhat indefinite extension of their range is partly determined by functional considerations, which are culturally parochial and utilitarian (in a material or symbolic sense). Hunn's position on (2) is more nuanced and, therefore, less internally consistent. Inasmuch as I believe (1) is right, Hunn's arguments also appear to me to be more nearly correct on certain points.

For Randall, the only allowable evidence for nonfunctional life forms would be that "prototypic attributes of highly inclusive botanical categories have been shown by interviewing to be exclusively perceptual." The only evidence that life forms are well bounded (in ranked, transitive taxonomies) would be that they have "no good examples," no prototypes. So the argument simply precludes the *possibility* of well-bounded *and* nonfunctional life forms. But prototypes concern verification and recognition of category membership, not definition or taxonomic status. Only the empiricist assumption that semantic domains are extensionally based warrants conflating meaning and reference in this way. This assumption is clearly inadequate for many, if not most or all, domains of meaning.

Everyday categories like DOCTOR and BACHELOR are not prototypically defined although there are "good examples" (people who wear stethoscopes and white smocks, men who are foot-loose and fancy-free). Such "prototypes" do not necessarily even belong to the categories in question. The point is that even if prototypic structures were implicated in recognizing members of folk-biological categories (as they doubtless are), such structures need not have anything to do with the logical character of those categories.

There often *are* broad categories that include most ordinary kinds of local flora or fauna and whose scope is functionally delimited, like "domestic" versus "wild." On closer examination, however, it appears that life forms are also present. I suspect this is generally the case.[1]

The avowal that there is "no evidence to show [ranked] taxonomies . . . are of any behavioral importance" involves another empiricist supposition, namely, there must be a direct relation between cognition and behavior. But what, for example, is the "behavioral importance" of focal colors or syntactic modifiers? Patently, they make everyday human behavior possible without uniformly directing specific actions in specific contexts.

Randall admits that transitive reasoning and contrastive definitions for higher taxa occur. But such reasoning may induce the native into error, while contrastive description, although "true . . . doesn't begin to define 'bird' or 'insect.' " Rather than such reasoning leading to informant error, however, evidence suggests that it allows the native (and ethnoscientist) to distinguish between recognitory heuristics, which aid in identifying instances, and classificatory modes of reasoning, which drive powerful generalizing inferences. Thus, among the Tobelo of Indonesia: "one often hears of a particular small sapling . . . 'this weed *(o rurubu)* is a tree *(o gota)*' (non-contrastive sense of *o rurubu*); or of the same sapling . . . 'this is not a (member of the) herbaceous weed class, it is a tree' (*o rurubu* here contrasts with *o gota*)" (Taylor 1978–79:224). As for contrastive definitions, they assuredly