The Proceedings of the International Conference on Creationism

Volume 5
Print Reference: Pages 445-456

Article 39

2003

The Cognitum: A Perception-Dependent Concept Needed in Baraminology

Roger Sanders

Kurt P. Wise
Bryan College

THE COGNITUM:
A PERCEPTION-DEPENDENT CONCEPT NEEDED IN BARAMINOLOGY

ROGER W. SANDERS, PH. D
1854 GREENWOOD ROAD
WEATHERFORD, TX 76088

KURT P. WISE, PH. D.
CENTER FOR ORIGINS RESEARCH AND EDUCATION
BRYAN COLLEGE, BOX 7802
DAYTON, TN 37321

KEYWORDS:
cognitum, cognita, classification, biosystematics, baramin, holobaramin, created kind, taxonomic concept, biosystematic concept, cognitive sciences, fuzzy group

ABSTRACT
The taxonomic concept of cognitum (pl., cognita) is introduced to study design among baramins and to relieve other taxonomic concepts (*e.g.* holobaramin, baramin, basic type) concepts from considerations that may hinder their development. The cognitum is defined as a group of organisms recognized through the human cognitive senses as belonging together and sharing an underlying, unifying gestalt. This concept recognizes the importance of human neuro-cognitive processes in classification. It also implies that, at creation, organisms were endued with characteristics that elicit a unique, divinely-created psychological response in humans and that, after the Flood, the descendant species of the surviving representatives of the baramins retained these specially created characteristics. The cognitum affords research into the relative contribution by objective biosystematic techniques and neuro-cognitive phenomena to the study of biological design and classification. It also promises to clarify current problems in singly nested hierarchies, conflicting characters (homoplasy), fuzzy boundaries of groups, and unplaced taxa. Through its use in the study of biological phenomena, criteria that have been or might be proposed for baramins can be evaluated independently.

INTRODUCTION
Psalm 19 and Romans 1 teach that creation is the general revelation of God, even in the absence of the special revelation of God's Word. Specifically, the design or ordered complexity of created things somehow convinces mankind that God exists and is the Creator. In the context of the design presupposition, biology ought to be an 'exegesis' of this general revelation to further the understanding of God's character and wisdom. Biological classification ought to be a part of this exegesis.

The fact that non-biologists can exegete the creation enough to be 'without excuse' (Rom. 1:20) suggests that human perception might be specifically designed to recognize the created pattern. This in turn suggests that a study of human cognition may aid creation biosystematics. At present creation biosystematics methods do not include such a method. Additionally, Wise [23] has suggested that God created life with some sort of higher-level design pattern. Creation biosystematics methods are currently unable to address higher-level pattern. This paper introduces a biosystematic concept, which we think permits the inclusion of both human cognition and higher-level pattern recognition into creation biosystematics.

THE NEED FOR HIGHER LEVEL CLASSIFICATION
Heretofore, baraminology methodology [*e.g.* 28, 31] has focused almost entirely on the study of the holobaramin. The holobaramin has been recently redefined as a group of organisms holistically unified by continuity and holistically disunited by discontinuity from all other organisms [31]. The holobaramin definition is based upon a belief about the structure of the biological creation, to which we will here refer as 'the holobaramin concept'. The holobaramin concept is that God created multidimensional biological character space criss-crossed with a network of discontinuities that circumscribe a number of islands of (potential) biological continuity. The known, realized organisms in each continuity island make up a holobaramin. The holobaramin concept also becomes the basis for what might be called 'the holobaramin method' – the successive approximation of the holobaramin by building monobaramins via

continuity and dividing apobaramins via discontinuity [8, 24, 25, 31]. So far, the holobaramin method has been applied to only a few biological groups (*e.g.* turtles [25], felids [11], grasses [28]), leaving perhaps several thousand groups still to be so examined. However, the examined groups do seem to show continuity surrounded by discontinuity. This suggests that the holobaramin concept actually reflects at least some aspect of God's biological creation.

We would suggest that in both theory and practice, baraminology's holobaramin method is an efficient means of identifying the smallest discontinuity-bounded regions of biological continuity. Utilizing this method provides insight into how God implemented design on the small scale, and how that design was preserved through the effects of both Fall and Flood. Holobaramin studies suggest how particular biological imperfections came to be [*e.g.* 26, 27] and suggest particular mechanisms of post-Flood diversification (*e.g.* via transposable genetic elements and genomic modularity [29, 30]). We conclude that the holobaramin concept with its associated holobaramin method is an excellent method of characterizing the fine-scale patterns in God's design – the brush strokes of His tapestry of design.

As excellent as we believe the holobaramin method to be as a fine focus in baraminology studies, it is not very well suited as a coarse focus. Wise [23] has suggested that there are biblical and theological reasons why God may have created life in a large-scale netted hierarchy. The partial success of conventional taxonomy [23] and the common hierarchical form of folk taxonomies [1, 7] seem to confirm that there really is a higher structure to God's biological design than just a bunch of holobaramins. There is almost certainly some sort of higher-level pattern to biological form. To recognize this pattern with the holobaramin method would be a long and tedious process, for one would have to identify and characterize a large number of holobaramins to see their large-scale distribution in character space. Thus to efficiently exegete super-holobaraminic design, there is need for an additional taxonomic concept to the holobaramin, a concept that would provide a needed coarse focus for baraminology studies.

FUZZY BOUNDARIES

We believe that one of the real patterns of life is that perceived groups are often not clearly bounded (*i.e.* they are 'fuzzy' or have 'fuzzy boundaries'). In a fuzzy group, a core group of elements is clearly recognized as belonging to the group but peripheral elements are characterized by mosaics of traits common to both the core group and outside groups.

The history of systematics suggests that this fuzziness of groups is widespread and typical of many taxonomic groups at different levels of the conventional hierarchy. In the eighteenth century as the desire to recognize 'natural' groups prevailed and before Darwinism took hold, the relationships were illustrated (especially in botany) as two-dimensional maps with characters weighted to make decisions where to place the peripheral elements on the maps [18]. Even under the evolutionary paradigm, a number of authors [2, 4] successfully conveyed their ideas of relationship with maps until the dominance of cladistic methods in the 1980s. Throughout this time, different authors developed conflicting hierarchical classifications because they weighted or valued different characters, and hence, placed the peripheral elements differently. Without any objective criteria for weighting characters, classifications were largely intuitive. Acceptance by the systematics community depended largely on the authority of the writer.

As a reaction to the intuitive and authoritarian nature of classifications, phenetic methods were developed beginning in the 1950s [18, 19]. It was hoped that the placement of peripheral elements would be made operational and repetitive. However, character conflict still resulted, regardless of whether characters were unweighted or variously weighted. Cladistic methods developed, in part, because the phenetic conflict in characters was believed to arise from applying characters too universally [19]. That is, phenetics treats the presence of *any* character – regardless of its homologous or non-homologous nature – as a similarity. In contrast, cladists use only characters shared by two or more members of a given group and *not* possessed by other groups, ignoring virtually all other characters. However, by the 1990s numerous cladistic analyses revealed that placement of peripheral elements remains equivocal in cladistic studies. The taxonomic distributions of even just the shared characters conflict with each other [12]. This led to the concept of homoplastic characters or homoplasies: provisional homologues that are not congruent with the majority of characters and/or not congruent with accepted evolutionary, nested hierarchies. These are characters that appear to be the same, but, when examined in the context of relationships suggested by all characters simultaneously, must be interpreted as originating in parallel, by convergence from different characters, or by reversal to an 'earlier' condition [12].

Thus, conventional systematics has neither eliminated the difficulty of classifying peripheral elements nor resolved fuzzy boundaries into clear-cut hierarchies. This is because conventional systematics requires that every element must be assigned to a taxon at the next higher rank: To do so, systematists usually use one of three solutions. These solutions, however, are themselves problematic.

1. Peripheral elements are combined with core elements to make a single group. The resultant taxon is then characterized with difficulty.
2. The core group is circumscribed and the peripheral elements are segregated into isolated groups equal in rank to it. The segregated taxa may or may not be easily circumscribed, depending on the amount of character overlap with the core and/or one another.
3. In cases with peripheral elements morphologically intermediate between two or more core groups, all the core groups and peripheral elements are united into a single, inclusive group. The resultant taxon often lacks a unifying gestalt.

THE IMPORTANCE OF PERCEPTION

Adam's taxonomy of the animal kinds on the sixth day of the Creation Week (Gen. 2:19-20) was accomplished so rapidly as to suggest that it was an intuitive activity for Adam. This in turn suggests something about both Adam and the world into which he was placed. Of man it would suggest that humans were created with both a desire and an ability to classify. Of the world it would suggest that organisms were created in some sort of classifiable pattern. The fact that God Himself encouraged the activity (vs. 19a) and the fact that the resultant names became fixed (vs. 19b) in a world later labeled 'very good' (Gen. 1:31) suggests that Adam's taxonomy corresponded with God's intention. This all suggests that God purposely created organisms in a pattern specifically recognizable to man and created man capable of recognizing that specific pattern.

Such may have been true of the creation before the Fall. But both human cognition and organismal form have degenerated after the Fall. Since the Flood, the kinds have also undergone substantial diversification. In the light of all this modification, does God's original pattern exist in the present? and if it does, can humans still recognize it? We suggest that the answer to both questions is yes. First of all, we observe that every child and every adult, every culture and every club seems to create names for things and then group things together and name the groups. This ubiquity of taxonomy suggests that the desire and ability to classify continues to be an important part of the human experience. Secondly, the fact that things still *can* be named and classified suggests that some sort of pattern *has* persisted to the present. Thirdly, we might expect that since God is unchanging and desires to be known, that the same patterns God desired Adam to see during the Creation Week might be the patterns He desires for us to see in the present. If so, then not only did He create organisms in the desired pattern and humans with the needed ability to classify, but He might also be expected to have created in such a way that that pattern of life and ability to classify would be preserved through time.

We suggest that this expectation is confirmed by the strong correspondence among biological classifications made by very different cultures and peoples. This is especially seen in the similarities found between scientific and folk classifications [1, 7]. First, there is similarity in the names used. In the western world, for example, the common appellations used by ancient peasants survived for centuries in the language of Latin. Eighteenth-century biologists then felt comfortable enough with those names to adopt many of them as the official genus names of those same organisms. In fact, English-speaking farmers still unwittingly use these classical Latin common (now scientific) names when they give the hog call, 'Suey' (*Sus* is the genus name of pigs), and when they name their cows 'Bossy' (*Bos* is the genus name of cattle). Second, there are similarities in how organisms are grouped by professionals and non-professionals. Most lay people, for example, are able to recognize different types of oaks as falling into a distinct category (oaks) from all other plants, reflecting the professional classification of oak species within the distinct genus *Quercus*. This is true also of different types of pines, roses, dogs, antelopes, mushrooms, and a host of other organismal groups. Thirdly, nested hierarchy, so important in the science of taxonomy is often a part of folk classifications as well. So-called 'primitive' societies, for example, commonly employ four or five hierarchical levels in their taxonomies. Fourthly, even something as distinctive and 'professional' as binomial nomenclature is often a part of non-professional classifications. In many folk classifications, the names of the most inclusive groups (*e.g.* 'plant', then, more specifically 'tree') are usually not utilized in the name assigned to a specific species. In folk taxonomies with four to five levels, for example, the names of the third and fourth levels are used to construct binomial names. If only one idiosyncratic species is known to the culture in a particular third-level group, only the third-level name is applied. The fifth level is reserved for distinguishing commonly encountered minor variants. For example, in the Tzeltal culture of southeastern Mexico, *enek'* is 'bean', *šlumil enek'* is 'ground bean' (*Phaseolus vulgaris*), and *cahal šlumil enek'* is 'red ground bean' [1, 7]. This suggests that the binomial nomenclature codified by Linnaeus for scientific classification reflects some sort of neuro-cognitive feature in human beings [7].

Another indication that both the created pattern and the ability to recognize it have survived to the present is found in the ease with which children classify organisms. What small child has not correctly classified species seen for the first time based upon previously learned species (*e.g.* calling a Mallard Duck or Canada Goose, 'duck' after learning that a Mandarin Duck is a 'duck')? One of us remembers seeing a toddler running up to a stuffed puma in a museum, stopping short in excited surprise, and asking, 'May I pet the kitty?' Even more startling is the ability to recognize the mallard as 'duck' or the puma as 'kitty' after learning 'duck' or 'kitty' only from simplified drawings in storybooks.

Yet another clue is found in Psalm 19:3 (New International Version) which says "There is no speech or language where [the heavens'] voice is not heard." Similarly, Romans 1:20 teaches, "For since the creation of the world, God's invisible qualities – His eternal power and divine nature – have been clearly seen, being understood from what has been made, so that men are without excuse". Thus, not only is human cognition a part of God's design, but it is integral to the process of decoding the design message (such as the biotic message of ReMine [9]). We suspect that, to a greater extent than has previously been recognized by systematic biologists, biological classification is dependent on the neurology and psychology of pattern recognition in humans and corresponds to God-created 'gestalts' in organisms. By 'gestalt' we mean the property or properties that emerge from the integration and synergism of multiple characters of an organism (including form, poise, and behavior). We suspect that the human brain has been designed to pick out very slight differences of proportion and of size, shape, and motion relations of whole structural units that are associated with intended distinctions of creation. Even evolutionary biologists have recognized to varying degrees that perception plays a larger role in classifying than is usually admitted [5]. Whether the emergent properties are inherent in the integration of the structural parts or whether they are generated during analysis by the human brain is unknown. A taxonomic concept and method that is dependent upon human perception is needed to identify this pattern of life. The science of baraminology currently lacks both the concept and the method.

THE COGNITUM CONCEPT

In order to facilitate the study of life and more specifically address these three needs (higher level classification, fuzzy boundaries, perception-dependent classification), we here introduce a bioclassification concept called the cognitum (pl., cognita). A cognitum is defined as a group of organisms recognized through the human cognitive senses as belonging together and sharing an underlying, unifying gestalt.

Higher Classification

A cognitum can exist at any level of inclusiveness (*e.g.* the red fox cognitum, the cat cognitum, the bird cognitum, the 'green thing' cognitum) and may or may not be hierarchically nested within other cognita (*e.g.* the wheat cognitum within the grass cognitum within the 'green thing' cognitum; but consider the platypus cognitum *not* clearly nested in the mammal cognitum or the black pepper cognitum *not* clearly nested in either the monocotyledonous or dicotyledonous flowering plant cognita). In traditional classification, taxa (*e.g.* baramins which are associated with particular conventional taxa) must be assigned to a single taxon of the next higher rank. Homoplasy causes instability of nested hierarchies as different authors propose different taxonomies for the same sets of taxa. However, cognita are not under the same requirements as conventional taxa. Although they can be hierarchically organized when appropriate, a given cognitum is neither assigned a taxonomic rank nor needs to be placed in a taxon of next higher rank. Small cognita having homoplastic characters are relegated to the fuzzy boundaries of more inclusive cognita, insulating the hierarchical pattern from instability.

Fuzzy Boundaries

The cognitum provides a short-term resolution to the fuzzy boundary problem because it is an informal taxonomic category delimited on the neuro-cognitive recognition response elicited by its core group. The inclusion or exclusion of peripheral elements is neither addressed nor allowed to alter the cognitum's taxonomic disposition. Whether one person would include the peripheral elements and another would exclude them is irrelevant to the taxonomy of cognita. At the level of a given cognitum, peripheral elements are ignored taxonomically as simply being the fuzzy boundary of the cognitum. At lower taxonomic levels, the peripheral elements may become small cognita themselves. Fuzziness at the boundary of a group, therefore, is viewed as an epiphenomenon. Among other things, allowing such fuzziness may permit the formal application of fuzzy-set theory [6] to biosystematics.

Perception-Dependent Taxonomy
Because it is explicitly based upon human cognition, the cognitum concept should be well suited for cognition-identified taxa. Cognitum studies will also allow the development of methodologies that identify taxa by means of human cognition.

Similiarities and Differences With Other Taxonomic Concepts
At its introduction, the holobaramin concept [8, 24] was sufficiently separated from the baramin concept (the biblical idea of 'created kinds') to allow each of them to be developed in parallel (separately but cooperatively). Indeed, we feel this distinction permitted more or less simultaneous baraminology studies in Bible [22] and biology [11]. For the very same reason, the cognitum concept is proposed as independent from both the holobaramin concept and from the baramin concept. By establishing the cognitum as a distinct concept, we hope to prevent confusion among the three. Indeed, we feel it is precisely this kind of confusion that led Seely [14] to a faulty exegesis of the word *min* [22]. We believe Seely imposed a cognitum concept onto the biblical *min* concept. As a result, Seely concluded that "*Min* means what it meant to those people at that time", and that *min* could be any group ranging from the level of variety to phylum.

It is noteworthy that the basic holobaramin method (convergence on pattern from above and below) can function as a picture of the process of converging on larger design from below (via holobaramins) and from above (via cognita). In the 'top-down' cognitum approach to classification, one can expect some approximation between higher-level cognita and apobaramins. With further development of the classification, less inclusive cognita may approximate holobaramins and successively smaller monobaramins. Even though some cognita may converge on the same set of species, the two concepts are and ought to be distinct. In like manner, many cognita are expected to approximate many well-known conventional taxa. The same mental processes that allow a particular cognitum to be recognized are the same that eighteenth and nineteenth century biologists used subconsciously to propose and describe most of the important taxa. Because cognita and conventional taxonomic ranks differ philosophically, so do the similarly composed groups recognized under these divergent concepts. As conceived here, the cognitum does not necessarily correspond to any existing taxonomic concepts or categories, including the holobaramin, the baramin, the basic type [13], the created kind, the species, the genus, the family, *etc.* Thus, the biosystematist is allowed to pursue the study of cognita without compromising the study of any other biosystematic concept.

EXAMPLES OF COGNITA
To illustrate the cognitum and how it might differ from standard taxonomic concepts, we point to groups such as bears and cats. Tyler [20] recently reviewed the available barminological data of the bear family, the Ursidae. The evidence is insufficient to identify any holobaramins, although a minimum of four monobaramins exist: the ursus group (grizzly, brown, black, and polar), the sun and sloth bear group, the spectacled bears, and the giant pandas. The species of the first three monobaramins are clearly to be classified as bears. However, the giant pandas have some characteristics of bears, some unique features, and many similarities with the lesser panda, which further shows similarities to the raccoon family, Procyonidae. Because giant pandas do not fit so clearly, there is considerable disagreement among systematists whether to classify them in the Ursidae, in the Procyonidae, or in a separate family by themselves or combined with the lesser panda. In this example, the majority of bear species clearly constitute a recognizable group, the bear cognitum. The giant panda constitutes a fuzzy boundary to the bear cognitum. Whether or not it is considered to be part of the cognitum does not alter the circumscription of the bear cognitum.

Unlike the status of ursid baraminology, the holobaramin for cats has been convincingly identified as the cat family, Felidae [11]. This includes the domestic cat, wild small cats, the pantherine cats (such as the lion, tiger, and jaguar), and the somewhat distinctive cheetah and cougar. Although meercats and hyaenas possess some cat-like characteristics, they are not part of the holobaramin. In conventional terms, the meercats and hyaenas constitute two small separate families (Viverridae and Hyaenidae) that are combined with the Felidae to make the superfamily Aeluroidea of the order Carnivora. In baraminological terms, the holobaramin Felidae is discontinuous from meercats and hyaenas, as well as all other created life. In terms of the cognitum concept, meercats, hyaenas, and felids are three cognita, but the meercats and hyaenas are also part of the fuzzy boundary of the felid cognitum (and perhaps of other cognita, as well). However, because all the felid species have a very clear 'cat gestalt', all are part of the core of the felid cognitum. In this case, the felid cognitum is essentially identical to the felid holobaramin in composition. However, the felid cognitum is a taxonomic group that elicits a God-given recognition response in humans; the felid holobaramin is a taxonomic group that occupies a God-determined biological character space that is bounded by discontinuity with other such groups.

Below, bear and cat cognita (and their constituent subsidiary cognita) are placed in more inclusive cognita that are also self-evident. We suggest using informal names and labeling the cognita with 'cogn.' – all in lower case until formal definitions for cognita are established. To emphasize how the cognitum differs from the conventional taxon, groups in the fuzzy boundaries are suggested.

- eucaryote cogn. (mesocaryotes [dinoflagellates] in its fuzzy boundary)
  - metazoan cogn. (sponges and other such groups in its fuzzy boundary)
    - vertebrate cogn. (tunicates, amphioxus, and perhaps the lamprey in its fuzzy boundary)
      - mammal cogn. (monotremes in its fuzzy boundary; because many marsupials are so outwardly similar to certain placental species, placentals and marsupials may not form separate cognita within mammals, *i.e.*, the core of mammals consists of both placentals and marsupials)
        - carnivore cogn. (pinnipeds, perhaps the raccoon family in its fuzzy boundary)
          - bear cogn. (giant panda in its fuzzy boundary)
            - ursus cogn. (sun and sloth bears in its fuzzy boundary)
              - polar bear cogn.
              - grizzly bear cogn.
              - etc.
            - spectacled bear cogn.
          - felid cogn. (meercats and hyaenas in its fuzzy boundary)
            - pantherine cogn. (lion-like behavior; puma in its fuzzy boundary)
              - lion cogn.
              - tiger cogn.
              - etc.
            - cheetah cogn. (puma in its fuzzy boundary)
            - feline cogn. (domestic cat-like behavior, puma in its fuzzy boundary)
              - domestic cat cogn.
              - lynx cogn.
              - etc.

RELATIONSHIP OF COGNITUM CONCEPT TO ORIGIN MODELS

We believe the cognitum is compatible with creationist models and, hence, baraminology, but not with evolutionary models. Why should this be so? We conclude that it has to do with the significance of morphological intermediates and chimeras in the opposing models.

Evolutionary models predict that a series of morphological intermediates either should connect ancestors (generalized forms) and descendants (canalized, divergent forms) or it should connect two or more distinctive groups that have diverged from a common ancestor. The intermediates should differ by the stepwise addition of derived character conditions (not by a mosaic of conflicting characters) [12]. Thus, the stepwise addition should allow a clear-cut multilevel hierarchy to be visualized and converted into classification.

Creation models generally propose that, in the creation of distinct baramins and the design of their underlying gestalt, similar structures were reused in different baramins but modified for special purposes in particular baramins. Furthermore, design components were recombined among baramins. Thus, among baramins reticulated associations of characters should obfuscate hierarchy. In the early post-Flood world, rapid expression and recombination of latent genetic information, exponential population growth in concert with rapid global dispersion, founder effects, and subsequent reproductive isolation occurred within baramins. This translates into a hypothesis of rampant speciation in the first several hundred years after the Flood. Species would be expected to fill much of biological character space by possessing different sets of character mosaics. Thus, successfully 'replenishing the earth' and its new habitats might well result in constellations of similar species, as well as the presence of peripheral species. Clear-cut hierarchies would not be expected within baramins. Indeed, because such hierarchies are so easily interpreted as evidence for descent with modification, creationists might expect God to have created baramins and their latent genetic information to be expressed in homoplastic, non-hierarchical patterns.

APPLICATION OF THE COGNITUM

Because the cognitum concept is compatible with creationist models, any advances in biology using the concept should also translate into advances in the understanding of baramins, especially in the area of design.

Design Studies

Consider design across created kinds (baramins), such as the bones and musculature of hind limbs among tetrapod baramins. First, the inference is made concerning the basic design vs. adaptive changes within a given baramin by comparing the hind limb among all member species or species groups – let's say in this case all cat species (assuming for the moment that cats are a created kind). Then the basic design of cats can be compared to that of other baramins. However, if this study were performed using the holobaramin concept, these comparisons cannot be made properly until sufficient numbers of holobaramins have been identified and the exact species composition of the holobaramins (and inclusive apobaramins) is known. Cognita, which can be identified rapidly, offer a chance for cross-comparisons at levels approximate to holo-and apobaramins long before holobaramins and apobaramins can be precisely delimited. Furthermore, because the cognitum is design-based, it is much more amenable to revealing design. Whereas the biological character space occupied by the species of a holobaramin would be revealed by multivariate methods, the whole of the design may not be. This would require knowing what part of the space unoccupied by known species also fulfills the criteria for 'cat-ness' or the 'cat gestalt'. By comparing the relative contribution of objective criteria and neuro-cognitive phenomena to the cognitum concept, one can determine how characters of the hind limb synergistically combine to produce the gestalt of the cat hind limb. Thus, the complete area of character space occupied by 'cat-ness' and its underlying design can be ascertained. Expanding the comparisons between other cognita, one could examine how the design of cat hind limbs differs from those of dogs, bears, and so on and how much design modification exists among them. Learning which parts of the design cannot be modified without disrupting the carnivore gestalt and function should follow. Finally, one can compare the underlying functions associated with a cognitum's gestalt to the variations of function in the various species of the cognitum.

Such studies of design, in turn, lend themselves to the evaluation of the validity and/or utility of structuralist and typological paradigms of the past, which should be reexamined by creationists. Modern biology is heavily biased toward reductionism and random processes. As a result, eighteenth and nineteenth century concepts of integrated structural wholes and discrete regions in biological character space are denigrated in universities and, hence, are not understood by professionals, including creationists [15]. Unlike Darwinism, which sees the spectrum of fossil and living forms in biology being brought about by mutation and selection over long eons, Platonist typology argues that the forms exist because they occupy all possible biological character space [10, 15]. The cognitive attributes of cognita would help reveal design patterns that are congruent with hypothesized alternate constraints (*e.g.* function, correspondence to basic environmental zones, ecological interactions and balance among members of an ecosystem, size relationships of parts, displays of God's attributes, God's concept of beauty and abundance) that might limit all of character space to just the 'possible' character space. Having operational criteria and lower-level applicability, the holobaramin concept is not well equipped to evaluate the claims of these paradigms. However, the recently refined holobaramin concept, based on discontinuities in biological character space, impinges on structuralism [31]. Within the baramin, created genetic information potentially can generate species to occupy all the points of possible character space within the bounds of the baramin. At these lower levels, comparing cognita that approximate monobaramins (genera and species group) should lead to a better understanding of design and genetic constraints that restrict the distribution of species within baraminic character space.

Likewise, cognitum-based studies of design across baramins contribute to examining the phenomenon of homoplasy and boundary fuzziness. Since other concepts do not recognize fuzziness at the boundaries of their taxa, they are not amenable to the study of homoplasy. Instead, homoplasy results in instability in the circumscription of taxa and in conflicting hierarchical classifications. Biologists can compare the gestalt of the small cognita to the gestalt of the more inclusive cognitum or cognita in whose fuzzy boundary it occurs. How much and in what ways do the homoplastic characters disrupt the gestalt of the core group? How do nucleotide substitutions differ in the core group from those of cognita in the boundary from those of other outside cognita? How are larger cognita chained by the intersection of their fuzzy boundaries? Because homoplasy is directly related to developing stable hierarchies and pervades conventional classification [12], the degree to which cognita cannot be hierarchically nested should also assist in the detection of widespread mosaic or reticulate relationships as predicted by Wise

[23]. We anticipate that new means of developing classifications other than in nested hierarchies will eventually result.

The process of identifying cognita for studies of cross-baramin design, structuralism, and homoplasy will result in a rapidly assembled informal classification, as illustrated above by the felid cogn. and bear cogn. Unconcerned with boundary uncertainties, baraminologists can construct streamlined hierarchical classifications quickly. A side benefit will be the demarcation of recognizable groups for study. In other words, it is not necessary for a creation biologist to determine first whether giant pandas, or even lesser pandas, are discontinuous with true bears (*i.e.*, not in the same holobaramin) or even whether polar bears and sloth bears are in the same holobaramin before attempting to study the hybridization, morphology, biochemistry, behavior, or character distributions in bears. Rather, it is necessary only to know that humans consistently recognize certain species as 'bears'. Once a group is selected, baraminologists will be freed to concentrate on testing the baraminic limits of the group without either having to develop a formal intra- and super-baraminic classification system or dealing immediately with anomalous taxa. Cognitum-based classifications would be provisional until baraminologists can relate baramins to the cognita, as well as develop methods to represent non-hierarchical, reticulating classifications. At that time, a classification would be erected in which boundary species are not ignored and a complete accounting of species is attained.

Concept Independence and Testing Baraminic Criteria

The use of cognita is expected to relieve the holobaramin and baramin concepts from considerations that may hinder their proper study. Even though the refined holobaramin concept provides a clear definition of holobaramins [31], the application of certain criteria needs further study. As now defined, holobaramins need not be encumbered with inadequately founded assumptions, especially those dealing with hybridization, homoplasy, and distribution of nucleotide substitutions. For example, to what degree is embryo development controlled by genetic input of both parents and when can this development serve as a criterion of a hybrid event – especially in the light of frog eggs dividing twelve times without a nucleus [21]? As the underlying biology of such phenomena becomes understood, some criteria may come to be associated with cognita. Maintaining independence of the cognitum will prevent complicating the issues of criteria for holobaramin membership.

In addition to the significance of homoplasy for understanding the grand sweep of design, homoplasy may also serve as a criterion for delimiting holobaramins. As one moves down through different levels in the taxonomic hierarchy toward the species level, is there some point at which homoplasy gives way to clear-cut phylogeny? Or is there one at which interbaraminic homoplasy gives way to intrabaraminic genotypic homoplasy? As baraminologists apply cognita to the problem of homoplasy and fuzzy boundaries, they will probably learn to distinguish homoplasy due to separate origins among different cognita from homoplasy due to genetic recombination within the same cognitum. If so, the level at which the type of homoplasy switches should also correspond to the holobaraminic boundary.

Incorporation of Cognitive Sciences

Like many other fields in our reductionist-dominated academia, cognition science has been developed without much regard to organismal biology and vice versa. Because of the universal creation and sustenance by a single Creator, these and other disciplines should be highly integrated into the young-age creation model. The cognitum concept should allow creation biologists to evaluate the cognition sciences and incorporate the best of them into creation biology. Examples of the type of research opportunities follow below. In all cases, the cognitum concept is better postured to deal with the issue conceptually than the holobaramin or baramin concepts. This allows each issue to be dealt with more quickly and efficiently. At the same time the cognitum concept has the advantage of conceptual independence.

- Human pattern recognition studies and experiments on the mental processes of gestalt formation and grouping by gestalts are needed. From these, baraminology can determine what actually makes up signatures of cognita and how these signatures are faithfully transmitted from one generation to the next.

- Is there a relationship between human memory skills and the divinely created structure of the biological world? The clear implication of Psalm 119:11 and Deuteronomy 6: 4-9 is that the Word of God is to be memorized because He has provided humans with a prodigious memory for such purposes. Consistent with this view is that indigenous peoples typically learn and remember 200-800 categories of organisms each containing one to twenty individual names [7]. Well over a century ago, George Bentham, a renowned plant taxonomist, believed that humans could easily memorize only about 200 major groupings and 10-100 groups each in multiple subsidiary hierarchical levels [16, 17]. When faced with the option of splitting into more, small, homogeneous taxa or lumping into fewer, large, more heterogeneous ones, he advocated lumping. In this way, he was able to recognize his ideal number of 200 angiosperm families. We find his ideas intriguing and reason that God might have created organisms in such a way that there were and are no more than a certain number of cognita nested within more inclusive groups than humans can remember. Perhaps even, the nested or netted structure of cognita corresponds to the type and size of structures humans can remember.

- As indicated in Romans 1:20, human neuro-cognition is heavily involved in seeing God's attributes in creation, suggesting that the biological world possesses modes of divine communication. An example would be Crompton's [3] concept of 'quintessence' -- a quality instilled in members of a given group to portray to humans one facet of the Creator's character.

CONCLUSION

The holobaramin concept is well suited for the intended functions, namely the identification of the Genesis created kinds and of the design implemented within those kinds. However, we believe baraminology should address the related studies of cross-baramin design and classification for which the holobaramin concept is not well suited. Therefore, we introduce here the cognitum, a taxonomic concept that explicitly incorporates human neuro-cognitive recognition response. Biblical revelation implies this response to be important in interpreting the general revelation of God through his creation. Therefore the studies using cognita are expected to reveal patterns of cross-baramin design (including fuzziness of groups, so-called convergence, and reticulation vs. hierarchy), why a particular group is recognizable, which combination of characteristics disrupt the recognizability, and what that group tells us about the Creator. Additional benefits of the cognitum concept will be 1) rapid identification of study groups and construction of a creation classification long before most holobaramins and baramins are identified, and 2) independence to prevent confusion between concepts and improve evaluation of baraminic criteria. In time, of course, the hope is that studies of all the biosystematics concepts (*e.g.* the cognitum, the baramin, the holobaramin) would converge into a single understanding (not necessarily a single concept or definition). To this end we encourage creationists in the cognitive sciences or neurobiology to help develop and understand the phenomenological basis of cognita.

ACKNOWLEDGMENTS

The Center for Origins Research and Education at Bryan College provided funds for RWS to travel to Dayton, TN, to confer with KPW. Todd C. Wood, as ICC editor, encouraged us and guided us in substantially improving an earlier draft of our paper. The anonymous reviewers are also thanked for their helpful comments.

REFERENCES

[1] Berlin, B., D.E. Breedlove, and P.H. Raven, **General Principles of Classification and Nomenclature in Folk Biology**, American Anthropologist, 75(1973) pp. 214-242.

[2] Bessey, C.E., **The Phylogenetic Taxonomy of Flowering Plants**, Annals of the Missouri Botanical Garden, 2(1915) pp. 109-164.

[3] Crompton, N.E.A., **Basic Type Biology,** Discontinuity: Understanding Biology in the Light of Creation, M. Helder, Editor, 2001, Cedarville University & Baraminology Study Group, Cedarville, OH, pp. 16-17.

[4] Dahlgren, R., **General Aspects of Angiosperm Evolution and Macrosystematics**, Nordic Journal of Botany, 3(1983) pp. 119-149.

[5] Hey, J., **The Mind of the Species Problem**, TRENDS in Ecology and Evolution, 16(2001) pp. 326-329.

[6] Klir, G., and B. Yuan, Fuzzy Sets and Fuzzy Logic: Theory and Applications, 1995, Prentice Hall, Upper Saddle River, NJ.

[7] Raven, P.H., B. Berlin, and D.E. Breedlove, **The Origins of Taxonomy,** Science, 174(1971) pp. 1210-1213.

[8] ReMine, W.J., **Discontinuity Systematics: A New Methodology of Biosystematics Relevant to the Creation Model**, Proceedings of the Second International Conference on Creationism, R. E. Walsh, et al, Editors, 1990, Creation Science Fellowship, Inc., Pittsburgh, PA, Volume 2, pp. 207-213.

[9] ReMine, W.J., The Biotic Message, 1993, St. Paul Science, Saint Paul, MN.

[10] Reynolds, J.M., **Intelligent Design and Discontinuity: Platonic Metaphysics as a Motivating Worldview for Discontinuous Biological Structures**, Occasional Papers of the Baraminology Study Group, (In revision). http://www.bryancore.org/bsg/opbsg/

[11] Robinson, D.A., and D.P. Cavanaugh, **Evidence for a Holobaraminic Origin of the Cats**, Creation Research Society Quarterly 35(1998) pp. 2-14.

[12] Sanderson, M.J., and M.J. Donoghue, **Patterns of Variation in Levels of Homoplasy**, Evolution, 43(1989) pp. 1781-1795.

[13] Scherer, S., Typen des Lebens, 1993, Pascal Verlag, Berlin.

[14] Seely, P.H., **The meaning of *Mĭn*, 'Kind'**, Science and Christian Belief, 9(1997) pp. 47-56.

[15] Sternberg, R.V., **Structuralism and Typology: Implications for the Theory and Practice of Baraminology,** Discontinuity: Understanding Biology in the Light of Creation, M. Helder, Editor, 2001, Cedarville University & Baraminology Study Group, Cedarville, OH, p. 15.

[16] Stevens, P.F., **Mind, Memory and History: How Classifications are Shaped by and through Time, and Some Consequences,** Zoologica Scripta, 26(1998) pp. 293-301.

[17] Stevens, P.F., **How to Interpret Botanical Classifications—Suggestions from History**, BioScience, 47(1997) pp. 243-250.

[18] Stevens, P.F., **Metaphors and Typology in the Development of Botanical Systematics 1690-1960, or the Art of Putting New Wine in Old Bottles**, Taxon, 33(1984) pp. 169-211.

[19] Stevens, P.F., **Evolutionary Classification in Botany, 1960 to 1985**, Journal of the Arnold Arboretum, 67(1986) pp. 313-339.

[20] Tyler, D.J., **Adaptations within the Bear Family: A Contribution to the Debate about the Limits of Variation**, Creation Matters, 2, No. 5(1997) pp. 1-4. (Full text online, http://www.creationresearch.org/creation_matters/97/cm9709.html [23 Jan 2002])

[21] Wells, J., **You Can't Get There From Here: Discontinuity in Development and Evolution**, Discontinuity: Understanding Biology in the Light of Creation, M. Helder, Editor, 2001, Cedarville University & the Baraminology Study Group, Cedarville, OH, p. 24.

[22] Williams, P.J., **What Does *min* Mean?** Creation Ex Nihilo Technical Journal, 11(1997) pp. 344-352.

[23] Wise, K.P., **Is Life Singularly Nested or Not?** Proceedings of the Fourth International Conference on Creationism, R. E. Walsh, et al., Editors, 1998, Creation Science Fellowship, Inc., Pittsburgh, PA, pp. 619-631.

[24] Wise, K.P., **Baraminology: A Young-Earth Creation Biosystematic Method**, Proceedings of the Second International Conference on Creationism, R. E. Walsh, et al, Editors, 1990, Creation Science Fellowship, Inc., Pittsburgh, PA, Volume 2, pp. 345-360.

[25] Wise, K.P., **Practical Baraminology**, Creation Ex Nihilo, Technical Journal, 6(1992) pp. 122-137.

[26] Wood, T.C., **Genome Decay in the Mycoplasma**, Institute for Creation Research, Impact, 340(2001).

[27] Wood, T.C., **The Terror of Anthrax in a Degrading Creation**, Institute for Creation Research, Impact, 345(2002).

[28] Wood, T.C., **A Baraminology Tutorial with Examples from the Grasses (Poaceae)**, TJ, 16(2002) pp. 15-25.

[29] Wood, T.C., **The AGEing Process: Rapid Post-Flood Intrabaraminic Diversification Caused by Altruistic Genetic Elements (AGEs)**, Origins (In press).

[30] Wood, T.C., **Perspectives On AGEing, A Young-Earth Creation Diversification Model,** Proceedings of the Fifth International Conference on Creationism, R. E. Walsh, et al., Editors, 2003, Creation Science Fellowship, Inc., Pittsburgh, PA, Submitted.

[31] Wood, T.C. et al., **A Refined Baramin Concept.** Occasional Papers of the Baraminology Group, 4(Submitted). http://www.bryancore.org/bsg/opbsg/