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On the Role of Culture in Color Naming.

Remarks on the articles of Paramei, Kay, Roberson & Hardin on the topic of Culture, Cognition and Color Experience.

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Comment on the foregoing articles is now provided to highlight and clarify some open questions and controversies raised in this issue. The primary goal is to provide a context for examining the long-accepted views from the cross-cultural color categorization and naming literature that are presented in the articles. For this reason alone, the articles by Hardin and Kay -- which present new analyses compatible with the established theory in the area -- receive more comment than do those of Roberson and Paramei, which, comparatively speaking, are less concordant with the established theory and reflect more culturally-specific views of color naming phenomena. In my opinion, each of the four articles in this issue contribute important perspectives on cross-cultural color naming research. Although the articles in this volume are ordered Paramei, Kay, Roberson, and Hardin, the comments presented here are organized to emphasize the authors’ common viewpoints and to provide an ordered development of issues the articles raise .

Clyde L. Hardin's "Explaining Basic Color categories":

The first paragraph of Hardin's article suggests that the assertion that no significant properties of color categories are biologically based ("as some cultural relativists do") disregards all that perceptual psychologists know about color vision mechanisms. Most researchers would concur that sensible cultural relativists agree with universalists that biology serves as an important constraint for color perception. For example, consider that 'color blind' individuals (who lack a type of color-sensitive cell in their retinæ) perceive a reduced color category structure compared to individuals who possess a full complement of color sensitive cells. Obviously retinal biology shapes perceptual experience in the 'color blind' dichromat.

The remaining portion of Hardin's argument is more difficult to accept, however, because although his first sentence acknowledges that there are "many properties of color categories that are a function of language and culture," he does not explore these much, opting instead to present support for the view that pan-human color processing is the basis for the universality seen in color naming and categorization behaviors.¹ A very different view, gaining popularity among researchers in the area, does not consider visual processing models to be an adequate theoretical basis for explaining complex **color categorization** behaviors, either within or across cultures. As an example, consider again the dichromat: Within a given culture, the anomaly of 'color blindness' does not prohibit an affected observer from properly learning and using the culturally-appropriate color terms and concepts (e.g., polar opposition of Red and Green) that refer to color appearances a dichromat observer has difficulty perceptually disambiguating (Shepard & Cooper 1992, Izmailov & Sokolov, 1992, Marmor, 1978). This ability to adequately use and comprehend

¹ Hardin frames his support for the accepted view through an analysis of several universal color processing results which are "primarily due to nature" ... as opposed to those ... "mostly due to nurture"(p.1). For the sake of comparing the two different views Hardin invokes, my comments here frequently refer to this highly simplified "nature/nurture" dichotomy.

color language and color categories, in the absence of perceptual correlates that differentiate among exemplars of various color terms and categories, provides a clear indication that a substantial (if not central) portion of color categorization conceptual behavior is not attributable to the usual biologically based visual processing explanations.

In my opinion, such aspects of categorization behavior require more comprehensive explanations, for both individuals and cultures, than the accepted view that Hardin presents, despite agreeing on the value low-level visual mechanism results provide concerning the constraints and non-arbitrary mechanisms involved in individuals' early color processing.

If the basis for cross-cultural color naming regularity is not universal biology, then what explains the frequently observed linkages described by Hardin between color naming universals and opponent-process based perceptually elementary hues? To pursue this we need to separately examine the links in the chain of the accepted explanation, essentially asking whether either of the “nature” or “nurture” views invoked by Hardin can be ruled out as possible (or partial) explanations for the apparent universality of perceptually elementary hues which “seems to transcend the idiosyncrasies of particular languages” (Hardin, p. 1). Here the goal is not to prove a ‘correct’ alternative explanation for the phenomenon, rather it is to ask whether a plausible alternative view can be specified, and if so, can that alternative explanation be similarly analyzed and ruled out as incorrect compared to the accepted view Hardin describes.

A simplified statement of the accepted chain of reasoning for the biologically-based explanation Hardin describes can be summarized by two statements:

(A) The hues most frequently and reliably named by individuals, and most

commonly named across cultures, are the perceptual elemental hues.

(B) Pan-human uniformity in color vision (typically linked by color naming researchers to opponent-processes visual mechanisms) is the basis for the widely shared significance for perceptual elemental hues (as compared to non-elemental hues).

The problem is that although Hardin's analyses (and much work in the Berlin & Kay tradition) show that statement (A) is often supported, it can be argued that the explanatory causal connection in statement (B) is not supported for (at least) two reasons:

(1) existing neurophysiological and psychophysical data indicates that individual variation in color vision mechanisms preclude the existence of uniform 'elemental' stimuli that could produce unitary perceptual experiences across observers; and,

(2) existing psychophysical data indicates that there is considerable individual variation in empirically determined perceptual elemental hue settings across observers and and cultures (Webster, et. al. 2002, Kuehni 2004).

Thus, given that the biologically based rationale in statement (B) is not the real explanation for observations in (A), then why does so much existing data seem to suggest that '(A) the hues most commonly named across cultures are the perceptual elemental hues'? Following Hardin's usage, can we rule out 'nurture' type explanation for statement (A)? Or can 'nurture' or cultural influences produce scenarios whereby perceptual elemental colors tend to be those most commonly named across many cultures?

At least one plausible nurture scenario -- one emphasizing color naming and categorization as a cultural practice or artifact -- explains the tendency to name elemental colors. That is, consider those cultures for which a linguistic gloss for 'color' exists as an autonomous lexical construct. In such a culture, the gloss for 'color' certainly operates as an important part of that culture's 'strategy' for transmitting (to new generations of individuals) knowledge of all the separate linguistic terms that make up the culture's color lexicon. Under one such transmission strategy, individuals undergoing the process of acquiring a culture's color lexicon might first implicitly master the concept of color by recognizing that what is glossed by the term 'color' is the culture's particular notion of 'how something appears to look-like.' Many languages that are classified at or above Stage V (using the original framework of Berlin & Kay, 1969; or recent revisions) have a separate abstract concept for 'color' represented by a superordinate linguistic term; although many unwritten languages -- those like Bellona (Kuschel and Monberg 1974) and Yeli Dyne (Levinson, 2000) -- do not have a native construct for 'color' indexed by an unborrowed superordinate lexical term, and thus may not have an abstraction for 'color' integral to its cultural transmission of the color lexicon.

For cases where a superordinate term exists, during transmission of the concept 'color' differentiation of 'pure' (or 'unitary') or 'blended' (or 'binary') forms of 'color' may occur. A tendency to begin by transmitting the simplest, unitary, cases first would imply that 'pure' cases of Black, White, Red, Yellow, Green & Blue (being appearances typified by less complex, or fewest number of, dimensional components) would be learned by individuals first. Indeed, this could be an advisable strategy for the cultural transmission of an abstract concept like 'color,' because using a simple set of items sharing common dimensional features (integral to the construct) may be optimal for the comprehension of the concept by individuals (c.f., Feldman, 2003).

Under this first transmission scenario, colors that are unlikely to be classified as perceptually elemental hues would be categories of greater complexity due to additional properties (or dimensions) as defining aspects (Feldman, 2003). For example, appearances glossed by the term ‘gold’ might additionally require ‘shimmer’ as a defining aspect in addition to the typical lightness, purity and hue aspects. Similarly, color categories comprised of exemplars which do not reflect a representative range of exemplar variation along principle dimensions in the space (e.g., saturation and lightness -- see Jameson 1997) would require additional specificity regarding the defining aspects of the category. Thus, a defining aspect of a greenish-yellowish, ‘Chartreuse,’ category could be distinctive lightness and saturation levels -- traits that are characteristic of chartreuse exemplars (i.e., chartreuse exemplars rarely appear dark and seldom unsaturated) -- and these specific lightness and saturation features (or defining aspects) of chartreuse category exemplars, imply that the category is conceptually more complex than another color category that is comprised of exemplars representing a range of values from the principle dimensions of the space (i.e., a full range of lightnesses, saturations, etc.), and which thereby is more simply and strictly summarized by a dominant hue feature as the defining aspect of the category (Jameson’s contribution in the next issue discusses this further).

Although the foregoing scenario for cultural transmission in the context of a superordinate term for color may seem slightly counterintuitive, it reflects one plausible nurture-based hypothesis, and is consistent with various developmental data indicating unexplained difficulties in color term acquisition (summarized by Roberson this issue) .

As a consequence of this argument, one could assert that (i) a color is more likely to be considered a perceptual elemental hue when color space features needed to define that color category’s best examples are minimal; (ii) cultures’ linguistic systems play a role in the definition of elemental colors when, as described, cultural variation in the occurrence of a native lexical term

for a superordinate ‘color’ concept influences which color appearances are naturally assigned lexical labels and the cultural transmission strategy for color lexicons; and (iii) cultural practices and influences can play a role in the definition of elemental colors when the dimensions culturally deemed to have high pragmatic value (e.g., cultural preferences for hues, Saito, 1996a, 1996b) are strongly biased in ways that de-emphasize the dimensions that the elemental color categories classically represent. In summary, it is suggested here that nurture-type explanations should not be ruled out as a possible basis for why perceptual elemental hues are so widely named across cultures, and that nurture-type explanations are plausible alternatives for explaining the highly cognitive and cultural behaviors observed in color categorization and naming results relevant to color appearances popularized by Hering’s theory of color opposites.

Note, of relevance is that some informants used for the languages described in Berlin and Kay (1969) were bilingual with English as one of their languages. Those authors acknowledge “...while it can be argued that bilingualism in English affects the results to some extent ...,” they do not support the possible objection that bilingualism of their informants distorted their findings (p. 12). Nevertheless, English bilingualism among those subjects implies an awareness of English’s superordinate term ‘color’ concept even though the foreign language tested may have lacked a native term for that abstract concept. Whether assessment of naive foreign language speakers who have no term for ‘color’ in their native language (and who have no familiarity with other languages with a term for that concept) would show a different tendency regarding the naming of elemental perceptual hues remains an open empirical question.²

For languages which lack a superordinate ‘color’ term, a nurture-based conceptual explanation can also play a role in the cross-cultural similarity in elemental hues loci (e.g., those

² Jameson and Alvarado (2003) found that compared to monolingual Vietnamese speakers tested, Vietnamese/English bilingual speakers assessed in their native-language Vietnamese nevertheless showed patterns of color naming and categorization similar to monolingual English speakers. The authors suggest that despite the context of Vietnamese assessment, bilingual subjects’ Vietnamese naming behaviors clearly reflected the influences attributable to second language English color categorization structures.

identified by MacLaury 1997a and discussed by Hardin, this issue). For example, in such languages, elemental hues can arise as salient colors for individuals and groups if either polar opposition or comparative color purity relations are linguistically salient. Thus, MacLaury's cross-culturally observed elemental hue positions may arise through a shared strategy of linguistically representing optimal color-opposite poles formed by the purest, unblended, extremes available in cognitive color appearance space. These two aspects of elemental hues, (1) color 'purity' and (2) polar-opposition pairing with another 'pure' color, may be a large part of developing a relational structure that distinguishes elementals from other non-elemental hues (see Jameson, next issue, and Jameson, accepted).

Thus, it is plausible that the difference distinguishing elemental hues from other hues could be a conceptual, or cognitive difference, as opposed to a difference arising from a neural processing substrate or similar 'channel' linked to opponent-process chromatic response functions present in low-level color vision mechanisms. Indeed, the latter linkage is seriously undermined by the fact that physiological response curve locations which the theory links to unique hue experiences do not actually coincide with spectral positions described as 'pure' elemental colors (see Jameson & D'Andrade, 1997, p. 301-308 for details).

Fortunately for the received-view of color-naming theory (i.e., the new variants of the Berlin & Kay 1969 theory see Kay & Maffi 1999), describing elemental hues in this cognitive/conceptual way remains entirely compatible with Hering's original opponent-colors ideas (especially for color naming systems sharing the complexity of English), as well as with the principles on which the Natural Color System is based (c.f., see Hardin's discussion, this issue). The only difference in the alternative explanation provided here is that cross-cultural elemental hue naming and elementary color salience are not determined by 'biologically based' channels. Thus, color-naming researchers can continue to use the Hering elementary colors as part of the

explanation for color categorization and naming results, as long as they do not rely on the typically implied opponent-process neurophysiological mechanisms as the basis for such results.

Hardin states: "Names for the Hering elementary colors are necessary and sufficient for naming all of the colors, a fact that justifies singling them out ...". The rationale for asserting this is strained because the same argument would apply equally well to a subset of three elementary colors consisting of Red, Yellow and Blue. Indeed, where strictly chromatic proportions are concerned (i.e., those Hardin discusses for the NCS color samples) one can describe color appearances equally well as ratios of only red, yellow and blue (as Goethe and others proposed), similar to the way they are typically described using ratios of red, yellow, blue, and green. In such a scenario, green colors could simply be described as proportional combinations (i.e., product mixtures) of blue and yellow. Thus, all green-containing colors, and any other color in the NCS atlas, can be described just as well using three red, yellow & blue proportions, as they can using Hering's four elementary colors.³ The question then is why is this strict summing of named proportions for red, green, yellow and blue primaries preferred as the operational definition for estimating NCS color proportions when a simpler, more parsimonious, subset of primaries is given by three primaries (red, yellow and blue), which provide a set of equally 'necessary and sufficient' descriptors for those color samples? The answer may follow from a general tendency to extend psychophysical color-cancellation primaries and their theoretical constructs into color naming research. In any case, I do not think the argument provided for 'singling out' the names of Hering elementary colors is any more compelling than one that could be developed for the alternative set of primaries suggested.

Hardin's article also compares data from human and chimpanzee color naming

(Matsuzawa 1985). Hardin argues that similar chimp and human color naming behaviors

³ One might criticize this alternative idea by asserting that estimating the proportion-of-green in a sample is in some way easier judgment than estimating the proportion-of-yellow-plus-blue. To assert such a criticism, comparative judgment difficulty should first be empirically examined, and in any case, judgment difficulty is not an explicit part of the rationale used to justify the necessity and sufficiency of the Hering color descriptors.

supports the notion that human color naming and categorization are based on the visual processing mechanisms shared by both species. It is true that chimpanzee and human color vision systems are highly comparable, however another plausible nurture-like interpretation of Matsuzawa's findings is that these chimp and human color naming data are similar because this chimp has acquired through training a similarity structure for the Munsell colors that resembles the similarity structure of human observers. Indeed, the chimp's acquisition of this similarity structure is implicit in its successful training (the set of training colors varied along all 3 dimensions of Munsell Hue, Value and Chroma, and only these 3 dimensions). Thus trained, generalizing such a similarity structure to categorizing other Munsell samples would minimally consist of recognizing stimulus differences in hue (H), lightness (V) and saturation (C) -- a task for which the primate visual system is ideally suited -- and appropriately sorting such samples into the highly-overlearned hue 'bin.' Pigeons, which have a very different visual system from Humans (see Varela, Palacios, & Goldsmith, 1993), can also be trained to sort color stimuli into the eleven basic color categories. Indeed, pigeons internal representation for basic colors form a hue circle suggesting "...that similarities among colors for pigeons are organized in a manner generally like those for humans. This is quite interesting in view of the anatomical differences between the species ..." (Schneider 1972).⁴ Thus, while such results are important for understanding generalization principles that are easily learned across species, they do not provide proof that similarity in color chip sorting across species is a consequence of shared color vision mechanisms.

Obviously, the present discussion of alternative nurture-like hypotheses reveal that I

⁴ Schneider (1972) trained pigeons to sort 11 colors (spectral lights ranging in wavelength, not Munsell samples). The findings suggest that human color categories represent a trainable, predictable, portion of pigeon's categorical color perception despite the tetrachromatic (or even pentachromatic) properties of those birds' color vision (Varela, Palacios and Goldsmith, 1993), and are consistent with related comments on the use of human hue categories in cross-species research (Jacobs, 1981, p.118) if one considers human color categories as a subset of categories perceived by a pigeon.

opposed the view that the strongest argument for the primacy of the Hering elementary colors in color naming is a neural processing argument, and prefer instead a more plausible higher-order cognitive argument. Thus, instead of considering that the "...names for the Hering elementary colors are necessary and sufficient for naming all of the colors, a fact that justifies singling them out ..." (as Hardin states), I believe the emphasis should be placed on seeking empirical explanations as to why it is the case that the color opponents Black/White, Red/Green and Yellow/Blue seem to represent phenomenal opposites and can serve as useful markers in cognitive color space across a range of individuals who vary considerably regarding the physical stimuli that evokes unitary hue experiences (e.g., Webster, et. al. 2002, Kuehni 2004), and who often vary considerably regarding individual's point locations for category best examples (MacLaury 1997b). In sum, this is not to say that Hardin's arguments for nativistic explanations are incorrect, per se, rather it is to suggest that in light of plausible nurture-like explanations it seems too early to declare that the biologically based explanations he describes are the only major determinants of the cross-cultural color naming behaviors he reviews.

Paul Kay's "Color categories are not arbitrary":

Kay's article discusses two principle issues: First, he examines data originally published as a challenge to the Universal-Evolutionary (UE) model; namely, the Berlin data of Roberson, Davies & Davidoff (2000) and the Yeli Dnye data of Levinson (2000). Second, he presents statistical analyses testing the plausibility of a universal tendency for color naming systems to be based on primary basic color categories (Black, White, and the Hering opponent colors Red/Green and Yellow/Blue).

Kay suggests that the results support two conclusions: (1) the reexamined data does not

challenge, but supports semantic universals and evolutionary regularity (the UE model) through a correspondence with elemental hues (MacLaury, 1997a), and (2) Berinmo and Yeli Dnye color naming show a statistical tendency towards a basic primary colors bias.

With regard to claim (1), would Kay's computed centroids from Berinmo and Yeli Dnye data continue to closely correspond to elemental hues points if the stimulus sets used permitted greater freedom of indexing between color appearances and color names? It is known that sampled empirical stimulus sets can produce patterns of naming uniformity that diminish if the available choice options approximate the variety found in natural scenes (cf. Braun & Julesz, 1998). This result implicitly raises the issue of the influence of empirical stimulus properties and settings on informants' response tendencies.

Second, Kay's assumption of equal probability computationally benefits his alternative hypothesis. He assumes that "... each of the 320 cells has an equal probability of receiving a hue centroid ...". This benefits the computations needed to reject his null hypothesis and accept his alternative hypothesis that the observed data closely fits the predicted model. This uniform probability assumption amounts to a zero-constraint scenario on the labeling of color -- a scenario that clashes with the sensible construct of 'target areas' that he defines.

Moreover, Kay's highly improbable null hypothesis stating that "hue naming centroids will bear no particular relation to the red, yellow and green elementals ..." is impossible not to reject, and in essence requires that for categories roughly glossed 'red', 'yellow' and 'green,' the Yeli Dnye share no features with the many languages examined by MacLaury when identifying his Universal Elemental Hue samples (MacLaury 1997a). This seems to me a little too much like straw man hypothesis set up to be easily rejected.

To summarize, both Hardin and Kay are rather adamant about the fact that significant

constraints on color naming exist. Kay closes his article with the comment "neither the Berinmo nor the Yeli Dnye data ... weaken the hypothesis that there exists universal constraints on cross-language color naming; indeed, they strengthen it," and Hardin opens his article with the comment "to assert that no significant properties of color categories are biologically based is to disregard what perceptual psychologists know about color vision mechanisms." The directness of these comments in support of universal constraints on color naming and categorization is warranted given the prolonged debate between a group of scholars who espouse very culturally-relative, anti-empirical views (cf. Saunders & van Brakel, 1997) and those who prefer to rely on what can be learned from the sometimes imperfect empirical data, and who represent the continuum of views from 'more nativist than relativist' to 'more relativist than nativist' (Paramei, Roberson, Alvarado & Jameson, and Dedrick contributing to these issues are expressing views of the latter). I believe that the heart of the difference in views expressed by the contributors of these issues, then, is not so much whether human visual processing constraints exist, but rather to what degree those constraints **determine** color categorization and naming behaviors within a culture and across diverse cultures. As seen in this issue's articles opinions diverge, with Kay and Hardin vigorously advocating universal categories and focal examples related to Hering opponent colors theory, and Paramei and Roberson arguing that certain social and linguistic factors varying across cultures contribute to color categorization and naming in ways that supplant what others attribute to universally prevalent opponent color appearance phenomenal channels. In my view, the crux of the debate rests in specifying what forms of proof are amenable and appropriate for addressing the very different forms of phenomena -- cultural and psychological/neuropsychological -- that contribute at one time or another to the development and maintenance of color naming and categorization systems across cultures.

In contrast to the widely accepted establishment views presented by Hardin and Kay in this issue, Galina Paramei and Debi Roberson's separate articles (this issue) describe empirical results that illustrate serious limitations of these views.

Galina Paramei's "Singing the Russian blues: An argument for culturally basic color terms":

Paramei's analysis of the Russian 'blue' categories makes a number of important observations regarding the dependence of results on empirical methods and data analysis techniques employed. For example, her empirical review for the Russian color terms Sinij and Goluboj illustrates the challenges inherent in generalizing 'foci' findings across color order systems (e.g., the Munsell, Natural Color System, or the Color-Aid System), and demonstrates that the stimulus set used greatly determines if a color term tested is found to empirically satisfy 'basicness' criteria. (For example, the 330 chip Munsell stimulus grid does not permit proper assessment of saturation and lightness variations which play a large part in differentiating appearances named Sinij and Goluboj -- a stimulus-set attribute consistent with MacLaury's 1997b findings for 'Goluboj'). Paramei's observations regarding the biasing potential of stimuli are consistent with the known stimulus set-effects in other perception and choice behaviors (c.f., Braun & Jules 1998, Kahneman & Tversky, 1984).

Touching on another methodological problem, Paramei implicitly cautions against making inferences about individual cognitive and linguistic representation of color when aggregate data is used -- a point frequently illustrated with the data of MacLaury's MesoAmerican color survey (1997b). This methodological consideration presents a challenge to the general practice of mapping discrete color category foci using aggregate data.

There is a natural question of whether color category boundaries are an issue that should garner as much attention as have color category ‘foci.’ In the Paramei article this takes the form of a discussion on the proper definition of color term ‘basicness,’ and it is implicit in her observation that individual differences in exemplar naming provide a starting point for examining category boundary differences. Indeed, the question implicit in Paramei’s analysis of the two Russian blue terms is “What dictates that there will always be not more than 11 basic color categories and terms in a given culture’s color lexicon?”

In view of her in-depth analysis for ‘Sinij’ and ‘Goluboj,’ Paramei raises the epistemological issue of whether a proper definition of basicness exists. There are languages for which all the criteria that are typically used to identify a basic term are satisfied by the alternative glosses. For example, such criteria are employed by some Caucus languages when describing blue-category stimuli. However, despite the fact that in these languages two blue terms may satisfy the crucial ‘basicness’ criteria proscribed by theory, there is tendency among some of them to limit color term basicness to a single gloss for each category. Such a practice seems to diminish the validity of the criteria used to define ‘basicness’ and further underscores the question that Paramei raises of what actually are the proper grounds for defining basicness and nonbasicness of color terms across languages.

For improving color naming theory, Paramei suggests the use of pragmatic psychometric measures and social and cultural constraints as important components for a theories of color naming and categorization. She also generalizes the Interpoint Distance Model (Jameson accepted, Jameson & D’Andrade 1997) to argue for a non-linguistic cognitive basis for the emergence of ‘goluboj’ from the natural partitioning of a large segment of perceptual color space that is ‘unnamed’ according to Basic Color Theory. She also argues for a greater recognition that color naming systems are dynamic linguistic entities, so that a given language’s color lexicon

should be expected to vary over time as locally salient cultural referents, linguistic drift, color term borrowing, and technological influences present pressure to change the language that indexes color.

In the end, Paramei presents a convincing case that Russian's 'Sinij' and 'Goluboj' represent a challenging 'special case' to many of the accepted tenets still robust in the recent updates of the Berlin and Kay Basic Color Term theory. As such Paramei's article builds a strong argument for exploring new explanatory perspectives for what is typically viewed as a 'solved' issue in cognition and culture research, and she presents several leads as to what those alternatives might be.

Debi Roberson's "Color categories are culturally diverse in cognition as well as in language":

Paramei's analysis of two Russian blues asks "Why does accepted theory dictate a limit of 11 universal basic color categories and terms?", Roberson's article asks "What aspects of color category universals are truly independent of language?" Roberson raises this question through a review of empirical data showing that color categories are greatly determined by a culture's color language. If, as Roberson suggests, cognitive color categories are highly dependent on one's learned language, and if color lexicons vary considerably across cultures, then the basis for the establishments' pan-human universal color category explanation is greatly undermined.

Bear in mind that Roberson's position is not as neo-Whorfian as it first sounds. Rather, Roberson and her colleagues believe that learned linguistic categories **facilitate** recognition of categorical partitions and correct perceptual classification of spectral continua, as opposed to strictly determining partitions of spectra. As such, Roberson's article represents a new version

of linguistic relativism which contrasts with Kay and colleagues widely accepted universalist perspective.

Specifically, Roberson examines the issue of whether speakers of a language can have more and different cognitive color categories than represented linguistically. She reviews results from the larger field of categorization -- some developmental, some cross-cultural -- which support a tight link between language and thought. Through her review she concludes that to the degree that color classification and categorization resembles other classification tasks, it is very unlikely that cognitive color categories are independent of the terms used to describe them.

She also presents convincing cross-cultural data comparing native speakers of Berinmo and English. Her results suggest that in even in non-linguistic sorting tasks native speakers engage in categorical perception in a manner congruent with their native color lexicon, and that neither group can easily make consistent classifications when taught the other group's color language distinctions. Her results support a tight link between linguistic labeling and cognitive categories.

In the end, Roberson presents the explanation that in acquiring color categories, individual learners master their culture's specific lexical designations for the continuously varying stimulus domain of color. Her conclusion is that "there are no color categories that are independent of the terms used to describe them."

Roberson's language-relatedness proposal is consistent with a predicted result made earlier in the context of discussing the Hardin article. That is, cultures which don't have a linguistic term for the abstract concept 'color' should have among its members a less robustly shared set of the classical elemental hue constructs. The rationale for this is that in the absence of an abstract concept like 'color of a thing,' a culture's color labels should be largely determined by contextualized pragmatics such as, 'good-to-eat appearing,' 'bad-to-eat appearing,' 'dangerous

appearing,' and so on. In such a culture, the classical elemental hue constructs (unitary red, green, yellow, and blue) would likely be of less communicative value (and therefore less frequently used), when compared with another culture that has a robust abstract concept for 'color' and a frequently used lexical term to express that concept.

Thus Roberson, like Paramei, calls for a reconsideration of the more culturally dependent aspects of color categorization and naming. In doing so, both reconfirm the views of others who have suggested that the historical emphasis of perceptual processing universals has hindered development of a full and proper explanation of color categorization across cultures (see also Jameson next issue, Dedrick next issue, and Alvarado & Jameson next issue for similar or related views). In contrast to the Kay and Hardin articles, both Roberson and Paramei call for a more comprehensive view of color categorization and naming -- to perhaps curb the over-reliance on low-level visual processing as the explanatory mechanism -- and to integrate into the empirical research the aspects of color naming and categorization which, to quote Paramei, find 'impetus from socio-cultural mechanisms' (Paramei, this issue).

Conclusion:

The four articles in this issue have had the common goal of trying to make sense of a range of empirical findings for color naming and categorization across different ethno-linguistic cultures. As is representative of the field, the explanations offered range from 'Universalistic' to 'Culturally Relativistic.' A popular version of the universalist perspective asserts that although color naming differences exist across cultures, they are largely explained by a model of pan-human shared color experience, and this determines the non-arbitrary basis by which all cultures categorize and name color sensations. On the other hand, a moderate form of the relativist

perspective argues that too much of color naming and categorization behavior is shaped by socio-cultural influences, and these influences produce differences in cross-cultural color naming which can not be explained by the most popular universalist explanations. I do not think either form of opinion disputes that human visual processing imposes constraints on human color behaviors. However, I do believe that enough questions are raised by the relativistic perspective to warrant the development of a more comprehensive explanation of cross-cultural color naming phenomena, and I believe that cultural studies and cultural factors should play greater roles in the new perspectives developed. The four papers presented in the next installment of this two-issue series aim to provide starting points and new approaches for developing a more comprehensive perspective, and sets the goal as gaining an improved explanation of the large corpus of existing color naming and categorization data.

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