Introductory Remarks on Cognition, Culture, and Color Experience

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Color naming and categorization research has benefited from a diverse set of interdisciplinary researchers investigating a wide range of phenomena: from psychophysical studies of front-end physical processing in human visual systems, to the philosophical questions of the epistemology and ontology of color sensations, to investigations of the uniformity with which humans across the globe see, think, organize, and communicate about color stimuli in the world. Indeed, the impressive set of multidisciplinary contributions seen in the 1997 volume edited by Hardin & Maffi is consistent with the wide range of investigators who place the study of culture, cognition, and color categorization among their primary interests today.

Research on color categorization and naming is particularly important to the study of culture and cross-cultural comparison because it represents one of the few areas of study that is both well defined as an area of multidisciplinary investigation and a relevant domain of psychological inquiry across human culture.

The collection of articles presented in these two volumes represents viewpoints from this wide set of research interests. The range encompassed in these articles reflects the current state of

Cross-Cultural Research, Vol. 39 No. 1, February 2005 5-9
DOI: 10.1177/1069397104267885

knowledge of researchers who, on one hand, tend to advance a pan-human universal physiological explanation for cross-cultural color naming and categorization behaviors (e.g., Kay, Hardin, and MacLaury) and researchers who, on the other hand, tend to advance explanations that discount that classical pan-human universal perspective and instead advance arguments for more culturally relative theories of cross-cultural color naming and categorization behaviors (e.g., Roberson and Paramei). Also represented here are theories from researchers who tend to blend these two perspectives to varying degrees (e.g., Dedrick, Jameson, and Alvarado). (As background to the present articles, interested readers might also consider a published tutorial on the importance of color in language and culture by Schirillo, 2001).

The resulting articles present eight points of view that touch on the issues currently essential and important for the study of color naming and categorization behaviors. One thing is clear from these articles: The collective understanding in the area has advanced significantly since the early investigations embarked on in the 1960s, and it is equally clear that there remains a number of issues still debated and in need of clarification (some of which are commented on in the "Remarks" at the end of this volume), as well as a need to develop a comprehensive account of the cross-cultural color categorization phenomena. The hope is that the diverse views contained in this and its companion issue of *Cross-Cultural Research* (Vol. 39, No. 2, May 2005) will provide the reader with a good appreciation for key issues central to ongoing empirical research on color-naming phenomena.

SOME DEFINITIONS AND CONCEPTS IMPORTANT TO THE CONTRIBUTED ARTICLES

Basic color terms and categories (primary and secondary). The most commonly indexed color appearance categories, named by the 11 lexical terms proposed in the seminal theory of Berlin & Kay (1969). These terms are *black*, *white*, *red*, *green*, *yellow*, *blue*, *orange*, *purple*, *pink*, *brown*, and *gray*. Primary basic color terms and categories consist of opponents *black*/*white*, *red*/*green*, and *yellow*/*blue* and are often linked in the color categorization literature to Ewald Hering's (1964) phenomenological opponent-colors theory, resulting in debates about their putative relationship to physiological opponent-processing mechanisms in the visual system. Secondary basic color terms and categories are *orange*, *purple*, *pink*, *brown*, and *gray*.

The Munsell Stimulus Array. A widely used stimulus set typically depicting 330 samples from the *Munsell Book of Color* (Munsell Color Company, 1966). The array derives from a mercator projection of the outer surface of the Munsell color solid, organized in a rectangle with a lightness continuum (Munsell value) along the vertical axis and a color (or "chromatic") continuum along the horizontal axis (for a schematic of the chromatic portion of the grid, see Figure 1 of Kay, 2005 [this issue]). Because the array draws from the outer surface of the Munsell solid, saturation of the represented samples varies from Chroma = 2 to Chroma = 16 (see Figure 3a from Hardin, 2005 [this issue]). This array, or similar versions of this array, has been used in the original Berlin & Kay (1969) study, the World Color Survey, the Mesoamerican Color Survey, and a large majority of published work from cross-cultural color-naming investigations. An approximate color reproduction of the array can be seen at http://www. ICSI.Berkeley.EDU/wcs/study.html.

Universal elemental hues. Four colored chips from the 330-chip Munsell stimulus array identified by MacLaury (1997a) as most universally representative of Hering's opponent colors (red/green and yellow/blue; see Hardin's [2005] Figure 3b). The four chips were derived using data from the original Berlin and Kay (1969) data, the World Color Survey (Berlin, Kay, & Merrifield, 1985) and the Mesoamerican Color Survey (MacLaury, 1997b). They are conceptually related to idealized phenomenal "elementary colors" of the Natural Color System (see Hardin, 2005).

Natural Color System (NCS). Another widely used color stimulus system (not unlike the Munsell Book of Color), comprising 40 hue pages (including a range of individual colored chips, or samples, for a single hue) representing regular slices, or steps, around the hue circle. As developed, any given NCS sample can be fully described by its proportion of Hering chromatic components (R, G, Y, and B) and by its proportion of black/white and chromaticness. The NCS is a system based on such proportional judgments. See Sivik (1997) for a comparison of the NCS system with other color-ordered systems used in color research. See Hardin's article (2005) for a discussion of the chromatic content of NCS samples and Hering's elementary colors.

Unitary and binary colors. Colors having only one phenomenal hue component are unitary colors (or "unique" or "pure" colors). So a unique red is a red that appears neither bluish nor yellowish. (Although, as Hardin, 2005, suggests, it is widely believed that "the perception of unique red occurs when the red/green channel is in an excited state while the yellow/blue channel is in equilibrium, so that there is neither a bluish nor a yellowish component, " there is strong evidence against this view [e.g., see Gegenfurtner & Kiper, 2003, p. 185, or Jameson & D'Andrade, 1997].) Binary colors are those that do not appear unitary. For example, orange is a perception of reddishness and yellowishness together; purple appears as a blend of red and blue.

Color category focals. The aggregate "best example choices" typically elicited from the widely used 330-sample stimulus array (see Hardin's [2005] Figure 1). The sample(s) that is most frequently identified as a color category best example is that color category's focus. Individual subject category foci can vary considerably from aggregate foci, and the latter are typically employed to a greater degree as support for the universal model than are the former.

Color category centroids. A point location in stimulus space calculated from the aggregated responses for naming individual color chips. Centroids are computed by averaging color system parameters (e.g., L,j,g for the Optical Society of America colors, and as described in Kay's [2005] article, H, V, C for the Munsell colors) for all samples called by a particular name, weighted according to frequency with which the name was used (Kaiser & Boynton, 1996).

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