The Hamar cattle model: the semantics of appearance in a pastoral linguaculture

Petrollino, S.

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ARTICLE INFO

ABSTRACT

The rich anthropological and ethnographic literature on cattle "color" and "pattern" terms has argued for the central role of the cattle model in the visual systems of pastoral cultures. This study provides further evidence to the idea of a cattle model structuring pastoralists' visual systems, and it explores the indigenous visual meanings of cattle "color" and "pattern" terms in Hamar, a language spoken in Southwest Ethiopia. The results show that pastoralists communicate and conceptualize all kind of visual experience in terms of cattle appearance: in the Hamar visual system features such as brightness, sheen and (de) saturation, rather than hue, are central to the meanings of at least some "color" terms; moreover, the conceptualization of categories referred to in mainstream languages as "stripes" or "dots" is based on features such as visual conspicuousness and stand-out effects rather than geometrical shape. The methods, tasks and stimuli used in the study were tailored for the collection of comparative data among different pastoral societies of East Africa. Their practical application is discussed, illustrating the effectiveness in revealing important aspects of cattle-centered meanings.

1. Introduction

The linguistic systems attested in pastoral cultures are rich in expressions referring to the physical characteristics of livestock, such as coat colors and patterns, horn shape, ear cut and branding. Whereas the cultural relevance of pastoralists' visual systems has received due attention in the anthropological and ethnographic literature, the study of the semantic systems for appearance and the linguistic encoding of visual qualities in pastoral cultures has not received much attention to date: this is surprising given that pastoral cultures, together with other lesser-studied linguacultures, are often mentioned as having visual systems that challenge the universalist claims on color cognition proposed by the Berlin-Kay paradigm (Berlin and Kay, 1969; Kay and Regier, 2006). This paper presents the preliminary results of a study carried out in Southwest Ethiopia among the Hamar people and it discusses the methodology developed for the investigation of this semantic domain (i.e., the so-called "cattle color and pattern terms").

The starting point of the study was the investigation of the visual categorization systems in pastoral cultures, with particular attention to visual features other than hue. The study among the Hamar aligns with other ethnographic studies, supporting the view that visual experience is expressed in terms of cattle appearance in pastoral cultures. The cattle model structures other domains of appearance, and in order to arrive at a deeper understanding of the indigenous meaning of the categories for appearance in pastoral cultures it is necessary to integrate and triangulate these results with ethnolinguistic analysis and naturalistic data.

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The paper starts with an overview of the color debate from the perspective of pastoral cultures (Section 2), including the main theoretical challenges posed by pastoralists' visual systems; this is followed by a brief introduction of the case study on Hamar and its visual system in Section 3; Section 4 discusses the main issues underlying the application of traditional methods (i.e. the free listing task and the color chip naming task used by Berlin and Kay) in pastoralist linguacultures; the rest of Section 4 is dedicated to the illustration of the methods and the formal tasks developed for the investigation of *appearance* in pastoralist societies; Section 5 discusses the results obtained with their application. Section 6 summarizes the main points raised in the paper.

2. The visual systems of pastoral cultures

As suggested by a body of literature too vast to cite here, there are visual systems, including those of pastoral cultures, that seem to be less chromatocentric in the sense that hue plays a less central role compared to the primacy of hue in the Anglo[1] conceptual world. Anthropological and ethnographic studies which focused on the visual systems of pastoral cultures (§2.1) have shown the central role of cattle in structuring the conceptual domain of appearance and the consequences of the "cattle model" for the qualities subsumed under the category of "color" in pastoral cultures (§2.2). The literature on the visual systems of non-industrialized societies has also highlighted the mistake of confusing universal patterns of color categorization with the effects of cultural and linguistic contact (§2.3).

2.1. Cattle color and pattern terms in the literature

The use of specialized vocabularies to describe animal coats in various African and Asian cultures was first described by Magnus (1880). Color and pattern terms in the languages spoken in pastoral societies of East Africa have received a lot of attention in the ethnographic literature; classic works include (in alphabetical order) Almagor (1972, 1978, 1983) on Dhaasanach (Ethiopia); Arensen (1992) on Murle (Sudan); Buxton (1973) on Mandari (Sudan); Dubosson (2014, 2016, 2018) on Hamar (Ethiopia); Dyson-Hudson (1966) on Karimojong (Uganda); Eczet (2013, 2018, 2019) on Mursi (Ethiopia); Evans-Pritchard (1934, 1940) on Dinka and Nuer (Sudan); Fukui (1979, 1980, 1986, 1994, 1996) on Boya/Narim (Sudan) and Bodi (Ethiopia); Galaty (1989) on Maasai (Tanzania, Kenya); Gulliver (1952, 1955) on Jie (Uganda) and Turkana (Kenya); Hazel (1997) on East African pastoralists; Lienhardt (1961) on Dinka (Sudan); Ohta (1989, 1986) on Turkana (Kenya); Seligman (1965) on various Nilotic people of Sudan; Tomikawa (1972) on Datoga (Tanzania); Tornay (1973, 1978) on Nyangatom (Ethiopia); Turton (1978, 1980) on Mursi (Ethiopia); Umesao (1966) on Datoga (Tanzania), Wymeersch (1988) on Turkana (Kenya), among others. [2]

The languages of African pastoral cultures and the specialization of the color vocabulary in the area of livestock animals have received attention also in the linguistic literature. Studies which focus specifically on the semantic and cognitive aspects of livestock color and pattern terms can be found in Eckl (1998, 2000) on Herero; Dimmendaal (2015) discusses several East African languages including Turkana, Mursi, and Chai; Storch (2005: 428–33) wrote on Dinka and Shilluk; Payne (2003) on Maasai; Taljard (2015) on Northern Sotho; Koopman (2019) focuses on Zulu bird lore but he discusses at length the relationship between cattle patterns and bird names, building on previous work on Zulu cattle color terminology by Oosthuizen (1996).

Other studies focused on historical-comparative investigations and on the historical semantics of color terms, including cattle color and pattern terms: see for example Rottland (1982, 1994) on Southern Nilotic languages; Rottland and Mous (2001) on Iraqw and Datoga; Storch and Vossen (2007) on Nilotic languages; Louwrens and Taljard (2008) on the link between cattle terminology in Khoikhoi languages and South African Bantu languages.

The description of terms referring to the appearance of livestock coats are scattered in the linguistic literature and mentions can be found in studies focused on color terminology in general[3], see for example Maffi (1984) on Somali, Prasse (1999) on Berber, Whiteley (1973) on Gusii, Okombo (1994) on Dholuo, van Beek (1977) on Kapsiki: these works report also on livestock color vocabularies. The overview on color terms in various Ethiopian languages by Leyew (2016) mentions cattle and livestock color terms for Oromo, Silt'e and other languages, including Bodi (after Fukui, 1979) and Afar (after Bliese, 1970). In the 90's, Greville Corbett co-authored several papers on color terminology in African languages, focusing on testing Berlin and Kay's hypothesis on basic color terms (see references in footnote 3): these papers mention some cattle terminology, see for example Davies et al. (1992, 1994) and Laws et al. (1995) on Setswana or Davies and Corbett (1994) on Xhosa.

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[1] In this paper the term 'Anglo' is used following the tradition of cross-cultural semantics (for example Wierzbicka, 2013; Wierzbicka and Goddard, 2014) and the field of study called 'English as a global metalanguage' by Levisen (2019a).

[2] Ethnographic literature on cattle color and pattern terms in other parts of Africa include de Wolf (1985) on Fulani, Schultze (1907: 264–267) on Nama, Seignobos and de Garine (2013) on Taurine cattle rearing in Cameroon and Nigeria.

[3] The literature on color terminology and categorization in African languages includes, among others, the large-scale typological survey on color lexicalization in African languages by Segerer and Vanhove (2019) and the overviews for African languages by Davies and Corbett (1997) and Payne (2020).
    Studies on individual African languages/language groups are Arbab et al. (2018) on Chakali; Bender (1983) on Sudanese Arabic; Blommaert (1985) on Bantu languages; Brindle (2016) on Chakali; Davies et al. (1994) on Ndebele; Davies et al. (1995) on Chichewa; Davies et al. (1997) on Damara; Laws et al. (1995) on Setswana; Dimmendaal (2015), on Tima; Grimm (2012) on Gyele; Hansford (2010) on Chumburung; Lindsey et al. (2015, 2016) on Hadza; Moñino (2004) on Gbaya;; Pollnac (1975) on Luganda; Maffi (1990) on Somali; Roulon-Doko (2019) on Gbaya; Tosco (1999) on Dhaasanac; Wescott (1970) on Bini.

Cattle color terminology is scattered in descriptive grammars and dictionaries, as for instance in Breedveld (1995) on Fulfulde; Last (1995) on Chai; Tosco (2001) on Dhaasanac; Nebel (1954) on Dinka; Ohta (1989) and Barrett (1988) on Turkana; Leus and Salvadori (2006) on Borana.

Illustrated books documenting cattle colors and patterns in African languages are Hangara (2019) on Herero; Infield (2003) on Runyankore; Poland et al. (2004) on Zulu.

Recent studies in experimental psychology by Jules Davidoff and his colleagues have focused on Himba's categorical perception of livestock's patterns (Goldstein and Davidoff, 2008) and on various aspects of Himba's attention and distractibility in relation to livestock's appearance and other social and cultural factors (Caparos et al., 2012, 2013; Davidoff et al., 2008; Fockert et al., 2007, 2011).

2.2. The cattle model

Anthropologists, ethnographers, and linguists who worked on the visual systems of pastoral cultures have claimed that cattle appearance constitutes a framework that structures the visual experience of the world (see for instance Evans-Pritchard, 1940; Lienhardt, 1961; Tornay, 1973; Turton, 1978, 1980). Magnus (1880: 9) was one of the first scholars who used color chips in non-industrialized societies in order to test color terminology cross-linguistically; he wrote about the Herero and the Damara of Namibia that "colors that coincide with those of cows, sheep and goats, they name without difficulty; but whatever is not a color of cattle, particularly blue and green, they cannot name, although they can distinguish them from the other colors, and when necessary use foreign words to designate them… Those who have not come into contact with foreign culture and foreign names cannot name green and blue, and think it highly amusing that there should be names for these colors" (original in German). Lienhardt (1961: 12) reported similar observations about the Dinka of Sudan: "Almost the whole extensive colour vocabulary of the Dinka is one of cattle-colours. A particular pattern or colour in newly imported cloth or beads is thus necessarily referred to by the name of the configuration of colour in cattle which it is thought most to resemble."

The ethnographic studies which in the 70's and 80's applied the denotation-based methodology of Berlin and Kay in the context of pastoral cultures confirmed the observations of early ethnographers and pointed out the difficulty in separating the cattle and color terminology. The anthropologist David Turton, in his famous paper "There's no such beast: cattle and colour naming among the Mursi" argued that all the color terms elicited by means of colored chips in Mursi (Ethiopia) refer to cattle appearance (Turton, 1978: 354; 1980); studies with similar findings include Arensen (1992) for Murle (Sudan); Fukui (1980, 1979, 1996) for Narim (Sudan) and Bodi (Ethiopia), Lydall (1978) for Hamar (Ethiopia), Tornay (1973) for Nyangatom (Ethiopia). These studies often mention that not all the terms for visual appearance can be mapped on a color chart, and color chips are not sufficient to study the lexicon for this conceptual domain, failing in revealing the multifaceted dimension of the meaning of these terms. Findings from non-industrialized societies (see for example Conklin, 1955) suggest that "color" as a conceptual domain can subsume non-colorific qualities, i.e., characteristics other than hue, brightness, and saturation. van Brakel (1993: 113) and Saunders and van Brakel (1997: 175) list (after Beck, 1972) other attributes that can be subsumed under the domain of color, such as shape, size, glossiness, fluctuation (flicker, sparkle, glitter), transparency, metallic appearance, pronouncedness and so on, see also Saunders (1992: 52–53) for a discussion. Arensen (1992: 86–92) reported texture (see §4.1 below) and degree of (de)saturation and fluorescence for Murle (Sudan) "color" terms and Lienhardt (1961: 12) mentioned the association of the term for "green" with freshness and rawness in Dinka (Sudan). These examples raise the question of what the basic meanings of the categories glossed with reference to "color" actually are in non-industrialized societies. Anthropological and ethnographic accounts suggest moreover that separating color vocabulary and pattern vocabulary in the languages of pastoralists is also difficult, raising the question of whether such separation makes sense in contexts where there is a high cultural reason to have several terms which combine together color-pattern configurations, and different shades of tan-brown-grey-black (see for example the discussion of the Hamar data in §4 and §5). Similar intricacies are reported also for societies in which other animals play a central cultural role, see Hess (1920) and Watson (1996) for (Bedouin) Arabic horse terminology, or Eades et al. (2013) for Arabic camel terminology.

2.3. Cultural evolution or influences of globalizing forces?

If most studies suggest that in pastoral cultures cattle provide a model to categorize appearance in general, other scholars have concluded that basic color terms can still be separated from terms for cattle appearance. However, the plausible effects that foreign cultural practices have on indigenous knowledge systems need to be assessed in order to determine whether basic color terms (and categories) in a language are the result of contact. Davies et al. (1992) in their study on Setswana color terms concluded that color as a conceptual category is "different […] and less salient" (Davies et al., 1992: 1095), yet they individuated six "abstract" or "pure" basic color terms, separate from terms with "restricted reference" such as cattle terms. In the follow up study (Davies et al., 1994) they tested Setswana children and reported on the effects of English (and schooling) on the Setswana color system and its acquisition. It is interesting to notice that the free listing tasks produced by Setswana children did not include cattle terms at all, a fact that was analyzed more in detail in a following paper (Laws et al., 1995) which also showed the effect of the progressive anglicization of Setswana culture on adults: Setswana male adults in urban

areas used fewer cattle terms compared to adults in rural areas (Laws et al., 1995: 55). The gradual disappearance of the cattle vocabulary, and the progressive emergence of an Anglo color categorization system can be attributed to the effects of cultural and linguistic contact. This case is very similar to the well-known documented study of the Bellonese (Polynesia) indigenous classification system replaced by English color categories (Kuschel and Monberg, 1974: 232).

The idea of the cultural and linguistic influence on color categorization has been on the table for a while, and in response to the evolutionary claims on color cognition,[4] researchers have pointed out that the spread and domination of foreign practices through globalizing forces should not be confused with the cultural evolution of mankind (Conklin, 1955; Tornay, 1973, 1978; Turton, 1980; Wierzbicka, 2008, *inter alia*); [5] it is thus of utmost importance to take into account the effects of cultural and linguistic contact and its consequences for indigenous knowledge systems and indigenous categorization systems.

3. The Hamar of South-West Ethiopia

The Hamar are agro-pastoralist people living in Southwest Ethiopia. They speak an Omotic language (Petrollino, 2016) and are surrounded by other pastoralist and agriculturalist groups speaking Omotic, Cushitic and Nilotic languages. The Hamar share with other pastoralist groups of East Africa typical features of 'cattle-complex' societies (Herskovits, 1926): in these societies cattle is not only a commodity, but it plays an important role in shaping the social identity of members of the society and it is central in rituals around birth, death and marriage. In cattle-complex societies cattle is considered part of the human society and individuals identify with their cattle, engaging in special relationships with selected animals; this peculiar human–animal relationship includes beautification practices (such as branding, ear cuts and horn modification) for a favorite animal which becomes object of special attention and praise; cattle and humans are connected through a complex system of naming practices according to which animals receive personal appellations on the basis of their appearance and behavior; herders, in turn, derive their own names and honorific titles from the visual appearance and the appellations of their favorite cow or ox (Petrollino, forthcoming). Jérôme Dubosson (2014, 2016, 2018) has worked extensively on the relationship between humans and cattle and the phenomenon of the "favorite animal" in East Africa from an ethno-archaeological perspective, with a special focus on Hamar culture and society.

Much of Hamar culture and history has been described by the anthropologists Jean Lydall and Ivo Strecker in numerous works and documentaries since the 1970's (see for example Lydall and Strecker, 1979a, 1979b, 1979c). Jean Lydall published also on linguistic aspects of Hamar (1976, 1988, 2002).

Hamar "color" terms have been investigated with the use of Letracolor cards (see footnote 11 below) by Ivo Strecker and Jean Lydall, in the framework of the volume edited by Serge Tornay, "Voir et nommer les couleurs" (Lydall, 1978; Tornay, 1978). The data on the Hamar visual system presented in this paper have been collected in Southwest Ethiopia by the author: the Color Aid Corporation cards were used as a starting point to complement Lydall's data from 1978; in addition, visual stimuli and tasks tailored to pastoralist cultures (see §4) were developed to study the Hamar indigenous categorization system. In what follows, a brief overview of the Hamar terminology for the semantic domain *appearance* will be given. The cattle-centered meanings of some of these terms will be discussed in detail in section §5.

3.1. The expression of appearance

Like for many other languages [6], there is no word for 'color' in Hamar, but rather a generic term for 'appearance', *bíshi* [7]. The term *bíshi* refers to the appearance of any kind of entity, or to paraphrase Lydall (1978: 556), "what the eyes can see" (cf. Wierzbicka and Goddard, 2014: 80–101 on the semantic universal SEE). The term refers to the outer surface of entities, and it contrasts with the term *zará*, which refers to what is "under" the outer surface. Instead of asking "what color is it?", the Hamar approximate equivalent is the question in (1) below. [8] The question triggers responses about perceptual qualities such as colorific qualities, but also shape, designs and other features which do not necessarily fall under the Anglo category "color".

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[4] African languages are moreover often reported as exceptions to the evolutionary hierarchy proposed by Berlin and Kay, because of various "gaps" in the evolutionary stages, see Dimmendaal (2015a, and Payne (2020) for an overview and discussion.

[5] See also Tornay's (1973: 7) observations for the Nyangatom (Ethiopia): "The importance of color in the life of the Nyangatom is not strictly related to technology. Semi-nomadic pastoralists and occasionally farmers, they do not practice the great techniques which offer color a privileged field of experimentation: weaving, dyeing, pottery, plastic arts. Color is above all an attribute of the body of living beings, and more specifically of animals" (Original in French).

[6] Many languages do not have a word for color but use a term that can be translated as "appearance", "type, kind" or "species", "pattern, drawing", "form, shape, essence" see, for African languages, the translations given by Arensen (1992: 87) for Murle (Sudan); Leyew (2016: 54–56) for Ethiopian languages; Brindle (2016: 87–89) for Chakali (Ghana); James (1988: 28) and Killian (2015: 136) for Uduk (Sudan); Roulon-Doko (2019: 134–35) for Gbaya (Central African Republic), Buxton (1973: 400) for Mandari and Turton (1980) for Mursi and Tornay (1973) for Nyangatom.

[7] A sub-type of appearance is the term *dánta* which refers to cattle types of appearance. The term derives from the existential predicator *daa* (cf. Petrollino, 2019) and it can be translated as 'way of being' both in the sense of 'appearance' and 'behavior'.

[8] All the Hamar examples in this paper have been collected and analyzed by the author. The transcriptions of Hamar data follow a surface-phonemic convention with the following modifications to the IPA: <j> for [ʤ]; <c> for the [ʧ]; <c'> [ʧ']; <y> for the palatal glide [j]; <h> for [ɦ]; <sh> [ʃ]. The following abbreviations are used: 2SG, second person singular; F, feminine; GEN, genitive; INS, instrumental; M, masculine; OBL, oblique case; OPT, optative; PF, perfect tense; S, subject.

(1) *bíshi-no*   *hátta*   *hamá?*
     appearance-F.S   what   express
     'What does the appearance (lit. the
     outer surface) express?'

Table 1 presents a list of Hamar terms relevant to the domain of visual appearance discussed in this paper. The Hamar terms are roughly glossed with English terms for solid colors, patterns, and designs but they also refer to qualities such as degree of (de)saturation, brightness, and sheen. The glosses and the translations used in this paper are poor approximations to meanings and they are meant only to give an idea of the words' referential range rather than capturing meaning from an emic perspective.

Table 1
Hamar terms for visual appearance.

Term	Gloss
tʼïá	blackish
cʼaulí ∼ cʼailí	whitish
deer	reddish
galáf	yellowish
cʼagáj	greenish
guitá	iridescent
úlɔ	blueish
silbí	dark.sheen
morá	desaturated
súra	pale
shamáj	roan
túrga	brindled
láala	color.sided
shɔ́ta	patched
bordí	large.spots
zargí	small.spots
labál	white.belly
balá	forehead.patch
gawá	bicolor.pattern

The terms are lexically underived nouns, they can be used predicatively and attributively; when used attributively they take typical Hamar nominal inflections and agree in gender and number with their heads.

The terms listed in Table 1 are used to describe the appearance of objects, plants, animals, and humans; the only exception is the term *cʼagáj* 'greenish' which has not been attested in descriptions of cattle and goat appearance. In addition to these terms, there are livestock-restricted terms which describe features of the ears, legs, tail, and horn shape. The terms provided in Table 1 can occur alone or they can be combined with the others to provide more refined visual descriptions (see the examples discussed in §4).

In addition to the terms listed in Table 1, Hamar employs three ideophones to describe pure or "intense" (Lydall, 2002: 5) hues: black '*dill*', red '*ɗii*', and white '*puu*'. Although these are used often in natural speech, they did not occur in the free listing task and in the color chip naming task carried out by Strecker and Lydall (Lydall, 1978), ideophones however were used in the coat naming task developed for the present study, as descriptors of cattle coats displaying solid colors.

4. Methodology for the semantic domain *appearance*

Despite some of the limitations of stimulus-based methodologies in the investigation of meaning (Koptjevskaja-Tamm et al., 2016: 441–442; Wierzbicka, 2005, 2013, 2018), such methods can give useful insights if integrated in a multimethod approach in which the data obtained with formal and experimental tasks are triangulated with ethnographic observation of linguistic and cultural practices. Ethnolinguistic observations during the tasks, rather than the "behaviourist reliance on responses to stimuli" (Wierzbicka and Goddard, 2014: 100), together with an attentive analysis of folk definitions, narrative and discourse linguistic material allow the contextualization of the terms in the cultural and linguistic systems in which they occur, highlighting the range of use and the distributional characteristics of the terms (Dimmendaal, 2015a; Lucy, 1997; Wierzbicka, 2008). This section discusses the application and the limits of the denotation-based methodology used by Berlin and Kays for the domain of color (Berlin and Kay, 1969) in the context of pastoral cultures (§4.1) and it presents the tasks and the stimuli that were developed for this study to gather descriptive and comparative data on the semantic domain of *appearance* in pastoral cultures of East Africa. The tasks (the coat naming task, §4.2, the coloring task, §4.3, and the pattern naming task, §4.4) were conceived to investigate visual characteristics other than hue, and they were intended as both experimental and flexible elicitation techniques so to fulfill the need for a balance between quantitative data and qualitative data, to establish consistency across the community and to make generalizations over a large sample.

The stimuli (Petrollino, 2020) and tasks were inspired by the denotation-based methodology used by Berlin and Kay and by the stimuli and protocols developed by the Department of Language and Cognition at the Max-Planck Institute for Psycholinguistics in Nijmegen for other semantic domains (Levinson et al., 2007). Livestock pictorial stimuli, moreover, have been used in psychological experiments on Himba's visual cognition (Fockert et al., 2007; Goldstein and Davidoff, 2008).

4.1. The color chip naming task and the free listing task in pastoral cultures

The main tasks included in Berlin and Kay's denotation-based methods consisted of a stimuli-based naming task [9] and a free listing task. These methods were criticized because of the Anglocentric bias towards hue: the use of the Munsell color chart implies that English color terms and "color" as a conceptual domain have ontological independence (van Brakel, 1993; Dimmendaal, 2015a; Wierzbicka, 1990, 2008). By using the Munsell color chart, the terminology under investigation is decontextualized (Saunders, 1992) and the lexical meanings of color terms are reduced to the denotational meanings of English terms (Lucy, 1997; Wierzbicka, 2008).

The color chip naming task alone cannot be used to comprehensively study the visual semantics of appearance. However, observing speakers' reactions to the tasks can also give valuable insights. Arensen (1992: 88) for instance reported interesting observations on Murles' reaction to the color chip naming task:

> "The chips were all shiny and smooth in texture. With colors that were not basic, some people, especially women, would stroke the chip and try and get a feel for its color. It was obvious that the concept of color was more than hue, and was tied to things like texture and light and dark".

A couple of pages later (Arensen, 1992: 90), he adds:

> "*Gidaŋ* […] was another term that most informants struggled with. Although this color can include both brown and gray, it was often used to describe the bark of trees. Again the chips were the wrong texture and confused the issue".

Arensen's observations for the color chip naming task reveal the importance of texture qualities in Murles' conceptual domain of appearance.

Free listing, a technique commonly used in social sciences, serves to calculate the psychological saliency of terms in specific domains. In Berlin and Kay's methodology the task consists of asking consultants to list color terms; saliency is calculated on the basis of the frequency and the position in the list of a term.

The free listing task in pastoral societies may produce lists of terms which include color, but also pattern and design vocabulary for animals, see for example the results of the task conducted among the Tswana (Davies et al., 1992: 1072) which included cattle color and pattern terms (Table 2):

Table 2
Setswana free listing task (ordered by frequency).

ntsho 'black'
setlha 'yellow'
sweu 'white'
hibidu 'red'
tala 'grue' (never for animals)
rokwa 'brown'
hunwana 'reddish-brown' (female cattle)
webu 'gray roan' (male cattle)
naana 'red and white' (male cattle)
nala 'red and white' (female cattle)

In the case of Hamar, the free listing task consisted of asking participants to list terms for *bíshi* 'appearance' (see §3.1). The lists included nouns which describe any type of appearance, including cattle appearance; Table 3 below shows an example of a listing task:

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[9] The stimuli used in the classic study by Berlin and Kay (1969) and in later studies such as the World Color Survey consist of 330 standardized Munsell color chips; the color kit developed by the Language and Cognition group at the Max Planck Institute for Psycholinguistics (Majid and Levinson, 2007) is a reduced version of the full Munsell color system and it includes 80 color chips. Other stimuli are the 28 Colorvue cards and 51 Letracolor cards used by Tornay (1973, 1978); the 65 Color Aid Corporation tiles used by Davies et al. (1992) are based on the Ostwald color system. These and other stimuli are all based on arbitrary models which arrange color on the basis of different parameters, obtaining samples which are representative of the color spectrum. It is not always possible to translate one system into the other, but color correspondences can be calculated when authors provide the CIE (Commission internationale de l'éclairage) specifications for each tile/chip, see for example the appendices in Tornay (1973), and the CIE conversion for the Color Aid Corporation tiles proposed by Arbab et al. (2018). The chip naming task is preceded by a color-blindness test, the most used in the field are Fletcher (1980) and Ishihara (1972).

Table 3
Hamar free listing task (first ten items).

Hamar term	gloss
tꞌíá	blackish
deer	reddish
cꞌaulí	whitish
úlɔ guíta	bluish iridiscent
shamáj	roan
bordí	large.spots
súra	pale
zargí	small.spots
balá	forehead.patch
labál	white.belly

In this regard the question of whether "pattern" terms and terms in the tan-brown-grey-black domain, given their psychological and cultural saliency, should be considered basic color terms in Berlin and Kay's paradigm has been raised by various authors (for example Saunders and van Brakel, 1997; Payne, 2020). Pattern terms and other terms for appearance, despite their high ranking in free listing tasks, cannot be mapped on a color chart because the cattle model is anchored on different principles compared to a hue-centered model; the monomorphemic terms *bordí, zargí, shamáj, súra, balá, labál* are not used in the color chip naming task for obvious reasons: most of them refer to designs and patterns, others to the so called "colored patterns" (see §4.4); these terms however are salient and normally used to talk about the semantic domain *appearance* (see the upcoming discussion of the results obtained with different methods).

Davies et al. (1992) has an interesting observation concerning "non-canonical" responses to the listing task. According to the authors, some consultants did not understand the instructions of the free listing task:

> "Some respondents required prompting before producing any color terms. They replied, for example, 'I don't know any colors' or 'do you mean colors of cows or colors of goats?' All respondents, however, did produce a list without requiring the observer to offer examples"

(Davies et al., 1992: 1072–1073)

The back translations of the instructions were as follows: "I am interested in the names people use for colors. Please tell me as many color names as you can - OK?" (Davies et al., 1992: 1069). The linguistic scripts provided in the paper is in English, so it is not known which Setswana expression was used to elicit "color" terms. The fact that the Setswana speakers did not understand the task and needed to associate the concept of "color" to specific animals is anyhow indicative of the different nature of the Setswana conceptual category, which clearly does not correspond to the Anglo concept. Berlin et al. (1976) mention the importance of finding an appropriate verbal formula to trigger the responses for the tasks: instructions should be given in the speaker's native language, and they should be formulated in a culturally appropriate way. But as various authors have pointed out (Lucy, 1997; Wierzbicka, 2008; Wierzbicka and Goddard, 2014 *inter alia),* how can we ask, "what color is it?", or "what are the terms for color?" if the language lacks a term for it? The fact that in many languages, including Hamar and other languages spoken by pastoralists (see §3.1, footnote 6), the visual properties of objects, plants, humans, and animals fall within the category of *appearance* suggests that the "color" concept is a culture-specific conceptual artefact. Thus, in order to study the semantic domain of *appearance* in pastoralist linguacultures, the starting point has to be the cattle model, and how this structures the visual domain.

4.2. Coat naming task

The coat naming task was designed to elicit vocabulary for describing the appearance of animals' coats, check the consistency within the speech community for describing animal appearance and understand how "nameable" animal appearance in the language under investigation is. Given the existence of breed-specific phenotypes (i.e., the set of observable characteristics such as coat colors and patterns), the picture sets used in Hamar displayed local Hamar breeds: the photographs were taken during guided tours in cattle camps and riverbeds with the help of Hamar cattle herders. 46 pictures of cattle displaying the coat of the animal were shown to 27 participants, unevenly distributed across gender and age. Since anagraphic age could not be always established, Hamar age-sets and statuses were used to select the participants. The task lasted 35–40 min per person. Participants were asked to name and describe the appearance of the animal in each picture. The formula used can be seen in (2a); if participants needed more context, they were prompted by asking how they would describe the animals in the picture if they would get lost (2b):

(2a)   *wáaki-sa*   *bíshi*   *hátta*   *hamá?*
           cattle-GEN   appearance   what   express
           'What does the appearance of the cattle express?'

(2b)   *wáaki*   *ka-idi-ánna*   *har*   *ha-giá?*
           cattle   be.lost-PF-OPT   how   2SG-say
           'If a cow has been lost, how do you describe (it)?'

The response was an expression describing the appearance of the animal: this consisted either of a noun alone or two nouns which combined various qualities such as sheen and color with patterns and designs specifications (cf. Table 1 above). Some responses included the term *wáaki* 'cattle' inflected for masculine or feminine gender depending on the sex of the beast in the picture. Participants generated one response for each picture; in a few cases a second response was added: this included a term which specified other aspects of the coat. Example (3) shows a typical answer to the questions in (2) with two responses (separated by a comma):

(3) *gawá,*   *c'ailí*   *gawá*
     bicolor.pattern   whitish   bicolor.pattern
     'Bicolor pattern, whitish with a bicolor pattern'

The term *gawá* refers to a bi-color pattern in which a darker area (usually the neck and the head) contrasts with a lighter area (usually the back, the flanks, and the belly of the animal). In the second response, the term *c'ailí* was added as an afterthought to specify that the most extended area is whitish.

Unless the coat in the pictorial stimuli displays a solid color without any visible pattern or design, the first and main response usually refers to patterns, designs, (de)saturation and sheen. Chromatic values are always added as additional visual descriptors if deemed strictly necessary. This means that the term *gawá* in example (3) is enough to characterize a coat type, regardless of its color. Similarly, a coat type like the one below (Fig. 1) can be described as *shɔ́ta* 'patched' regardless of the color of the patches.

Fig. 1. Cattle coat labelled shɔ́ta, 'patched'.

The responses obtained in the coat naming task were then analyzed for grammatical category and consistency across the language community and compared with the results obtained with the other tasks (§5).

The coat naming task was re-adapted in a follow-up investigation and used in a less experimental setting to prompt staged communicative events and gather information about the wider referential range of the collected terms, their distributional characteristics and grammatical features. The stimuli were used to trigger natural conversations in which the participants could assume a more controlling role compared to the structured setting described above. Since the study was carried out in a monolingual setting, the pictures allowed the collection of folk definitions, including detailed descriptions about the visual characteristics of the body of the animal that Hamar herders pay attention to (see Fig. 2).

Fig. 2. A participant points at a specific part on the animal's body while explaining the meaning of a term.

4.3. Coloring task

The coloring task is an adaptation of the body coloring task used to study the extensional meaning of body part terms (van Staden and Majid, 2006), and it has been inspired by the ethnographers' representation of pastoral vocabularies (Fig. 3).
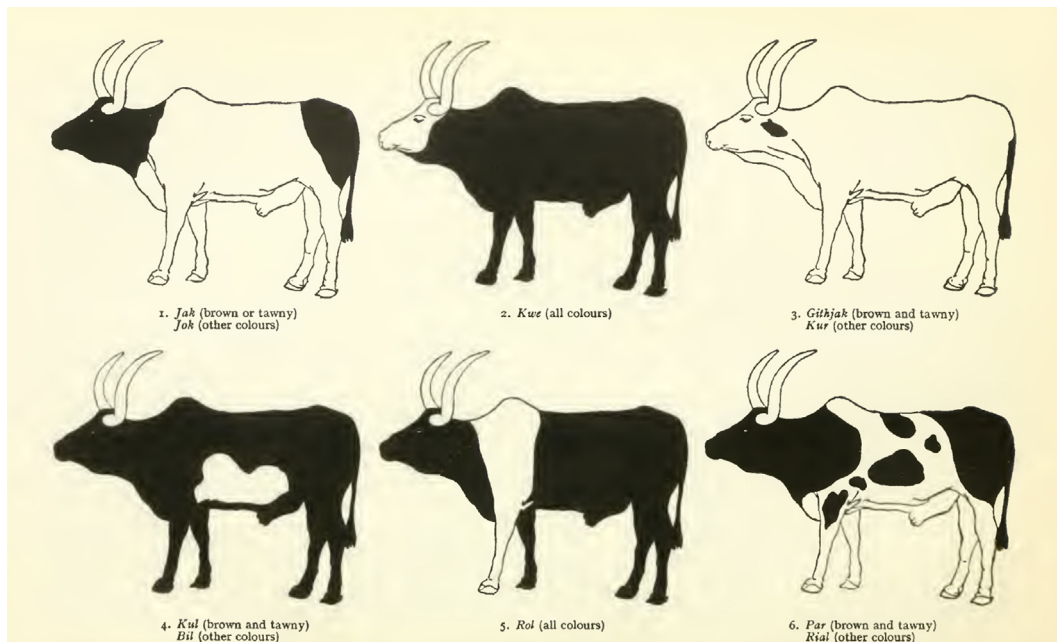

Fig. 3. Nuer cattle representation by Evans-Pritchard (1940).

The idea behind the coloring task was to let language speakers sketch cattle appearance by asking them to color in the empty profile of a cow. The coloring task was performed to better understand the representation of appearance that is prevalent in pastoral cultures and to identify visual features which are diagnostic for the herders' classification system. The coloring task provided insights on the distribution of patterns and/or specific pigmentations on the animal's body: the position of colored areas and patterns on specific areas of the body can be one of the diagnostic properties which are central to the meanings of specific terms (see §5.1 for further details).

Participants were given the empty profile of a cow (see Fig. 4a) and they would be encouraged to show, by coloring, a particular term. The task could be performed in two ways: the first option was to use an artificial color which does not naturally occur on animals' coats (for example a blue fine liner pen); the second option was to use a variety of colored pencils. The use of colored pencils was not important to understand the chromatic values subsumed in the meanings of the terms; rather, the participants' choice of whether using colored pencils instead of a fine liner pen was crucial to understand whether colorific or non-colorific properties of a particular category are central to its meaning. Terms that can be represented solely by an artificial color refer to categories which are not bound to specific color configurations, and they can be considered "pure patterns". Some terms, however, might conflate colorific-like and pattern-like qualities, requiring the use of colored pencils. These terms have been referred to in the literature as "colored patterns", "patterned colors" or "color + design"; these labels suggest a conceptual distinction between "colors" and "patterns", whereby in pastoral cultures there are clearly some "colored patterns" which are conceptualized as unitary. In Fig. 3 above, for example, the glosses proposed by Evans-Pritchard specify whether a pattern term includes colorific qualities: the patterns represented by the drawings might occur in "all colors" or only as configurations of specific color combinations.

The pictures below (Fig. 4) show an example of a profile colored with the artificial color and representing the pure pattern term *túrga,* 'brindled' (Fig. 4b), followed by the colored pattern term *silbí* (Fig. 4c), realized with brown, red, black, and grey pencils and by highlighting the areas on the body in which sheen and high saturation occur (see §5.1 for further details).
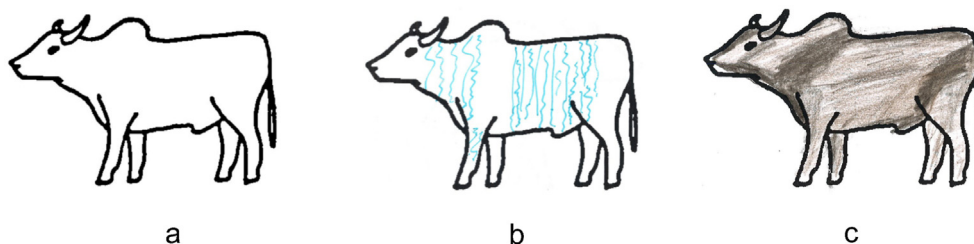
Fig. 4. The empty cow profile used for this task (a); a "pure pattern" term represented with an artificial color (b); a "colored pattern" term realized with colored pencils (c). (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

The coloring task was performed in informal, interactive coloring sessions by individuals alone or by couples and small groups. The time needed for the completion of this task varied depending on the number of drawings, on the skills of the participant and on the setting of the test.

4.4. Pattern naming task

The pattern naming task is an adaptation of an experiment carried out by Katsuyoshi Fukui, a Japanese cultural and cognitive anthropologist who worked on the cognition and classification of cattle appearance among the Bodi pastoralists in Southwest Ethiopia and the Narim in South Sudan (Fukui, 1979, 1980, 1986, 1994, 1996). Fukui built on the observations of other anthropologists that the visual systems of pastoral cultures are anchored on the model of cattle appearance: like other East African pastoralists, the Bodi of Southwest Ethiopia communicate visual experience in terms of cattle appearance. After testing Bodi's color cognition (1980), Fukui developed a set of abstract geometric patterns and designs and showed them to members of the Bodi community asking to name each card. Cattle terminology was consistently and without hesitation applied to the cards (Fukui, 1996: 331), in the same way participants name colored chips in Berlin and Kay's experiment. [10] According to him, this suggests that "the cognition of patterns is based on the coat-color of cattle" (Fukui, 1996: 335).

The set of geometric designs created by Fukui has been slightly modified (see Petrollino, 2020) and tested with the Hamar of Southwest Ethiopia, after noticing that Hamar speakers too describe the appearance of clothes, blankets, and beadwork in terms of cattle appearance. The pattern naming task highlighted interesting aspects of the visual meanings of cattle terminology, especially in the domain of geometrical patterns and designs.

The stimuli for this task included 68 numbered designs which were printed as laminated cards of 12 × 6 cm. Once printed and laminated, the cards had a matte finish (see Fig. 5):


Fig. 5. An example of geometric pattern cards used in the pattern naming task.

Participants were asked to describe and name the appearance of the cards; when talking about the cards, speakers sometime referred to them as *afála* "clothes". The task was performed with individuals but also with small groups to make it less burdensome and to observe natural conversations accompanying the task.

In his study, Fukui noticed that some of the pattern cards would be named differently if rotated: the cards with the white area on the edges illustrated in Fig. 6, for example, were conceptualized as the body of an animal and named after cattle with a white head (*bholloga*) or a black coat with a white tail (*chokaji*) (Fukui, 1996: 335–336), however Fukui does not explain why the white area on the left would be conceptualized as the head of the animal and not vice versa, since the position of a cow is not fixed in space.

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[10] Fukui reports that not all cards could be named, the reason for that being that "there are no cattle with this coat colour" (1996: 334), cf. Turton (1980), "There's no such beast".
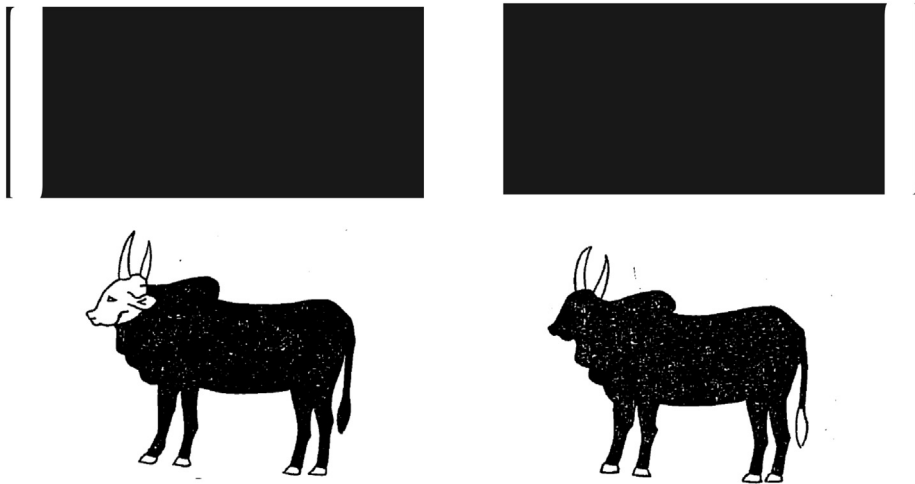
Fig. 6. (Left) The card and the cattle coat named bhollaga, 'white head', (right) the card and the cattle coat named chokaji, 'white tail' (Fukui, 1996: 335–336).

As discussed in the next session, the study among the Hamar also shows that the appearance of pattern cards is conceptualized and described in terms of cattle coats. The patterns below for example were described as *balá,* a term which refers to the white patch on the forehead of an animal (see Fig. 7):

Fig. 7. balá (white head) patterns.

Pattern cards displaying wide white patches in the middle were named *labál,* a term which describes cattle with a white underside patch which can extend to the flanks of the animal; the longitudinal extension of an area over a colored or darker background seems to be a common feature of pattern cards named *labál* (see Fig. 8):

Fig. 8. labál (white underside patch) patterns.

The use of terms for cattle appearance in other visual domains can be tested with a wide range of stimuli, for example actual fabrics and clothes (see §5.2 below); the pattern cards were developed for practical reasons, to gather cross-cultural and cross-linguistic comparable data among other pastoralist groups. The pattern cards, moreover, allow one to capture small differences in the description of appearance: by altering visual variables such as the width and longitudinal vs. latitudinal orientation of the stripes and patched areas on the card, it was possible to understand the differences in the conceptualization of stripes and dots. A preliminary analysis of the pattern naming task among the Hamar shows that the Anglo notion of stripes and lines does not fall within the same Hamar category; rather, Hamar classifies together lines, dots, and other designs (see §5.2). Similarly, the striped cards in Fukui's study received different labels, suggesting that other principles such as stand-out effects and visual conspicuousness are at play in pastoralists' categorization systems.

5. Discussion

The coat naming task, the coloring task and the pattern naming task complement each other, and the results shed light on the link between what consultants see and the language they use to refer to it; moreover, the results can be compared to determine which features are essential to the visual meaning of the terms. The comparison of the drawings with the responses obtained in the coat naming task and in the pattern naming task helped, for instance, to detect details which are not noticeable by a non-expert's eyes but that may be diagnostic for the classification of a coat. Fig. 9 below, for example, shows the stimuli that elicited the Hamar term *gawá* glossed as 'bicolor.pattern'. This term refers to a bi-color pattern as can be seen from the pattern card, the coat picture, and the drawings below:
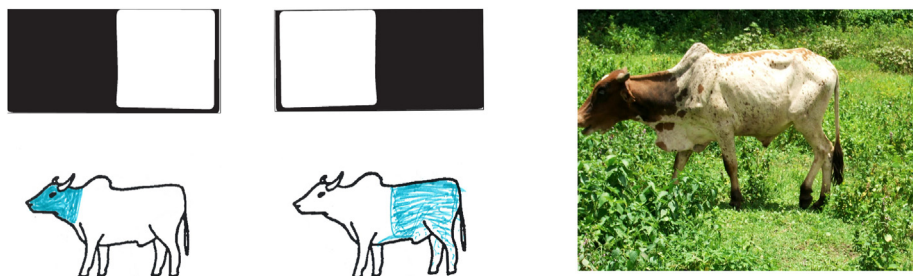

Fig. 9. Stimuli corresponding to the term gawá, 'bicolor.pattern'.

The pictures below in Fig. 10 also show a bi-color pattern similar to the one observable in Fig. 9, however they never elicited the term *gawá:*
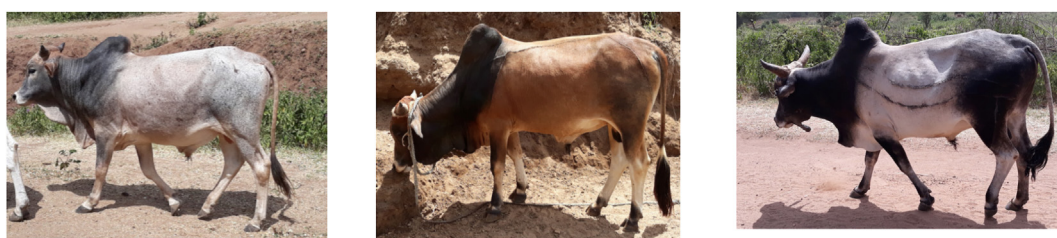

Fig. 10. Picture stimuli which are not classified as bi-color patterns, gawá.

By looking closer at the drawings in Fig. 9, one can notice that the dark colored area on the head and the neck of the animal stops just before the hump, whereas in the coats in Fig. 10 the hump is included in the dark area. This feature is diagnostic in the Hamar taxonomic system for the classification of a coat as *gawá*. Other diagnostic features were individuated in the same way and with the help of speakers' explanations during the discussion of the results.

5.1. The importance of brightness, sheen and (de)saturation

Given the high cultural value of cattle (and cattle appearance), the languages spoken by pastoralists have several terms in the tan-brown-grey-black domain. Various shades of brown and grey, for example, can be referred to in Hamar by three (apparently) overlapping terms. The table below shows the translations with respect to hue of some of the terms in the tan-brown-grey-black domain provided by Lydall (1978) (see Table 4):

Table 4
Tan-brown-grey-black domain in Hamar

Hamar term	Translation (Lydall 1978)
deer	Red, purple, bright brown
morá	Grey and brown, all colors except for yellow and purple
silbí	Brownish, reddish stones, velvet-like coats
súra	light grey, white, fawn, yellow

While the terms *deer* and *morá* are used by Hamar speakers to name some color chips, [11] the terms *silbí* and *súra* are hardly ever employed to name colored chips, however they occur in the free listing tasks (see §4.1). The four terms *deer, morá, silbí* and *súra* are regularly used in the coat naming task, and interesting insights on the visual meaning of these terms could be gathered from the coloring task and pattern naming task.

For example, the term *silbí,* here loosely translated as 'dark brown coat with a glossy appearance' is described in Hamar folk definitions as a mixture of *deer* 'reddish' and *t'iá* 'blackish'. The prototypical *silbí* coat (Fig. 11) shows brown-red-black tones and it appears as glossy pigmentation on specific areas of the body: the dorsal line along the back and a transverse line across the withers must have a glossy appearance (cf. Lydall's translation "velvet-like"); the upper legs also exhibit a sheen.

Fig. 11. silbí coats.

Coats described by the term *morá,* instead, usually display a solid color, more desaturated compared to *silbí* (see Fig. 12):

Fig. 12. morá coats.

In the coloring task the *silbí* coat was realized with brown, red, and black pencils, with highlights on the areas where the glossy appearance is normally concentrated (Fig. 13 on the left), whereas the *morá* coat was realized with grey and brown pencils (Fig. 13 on the right):
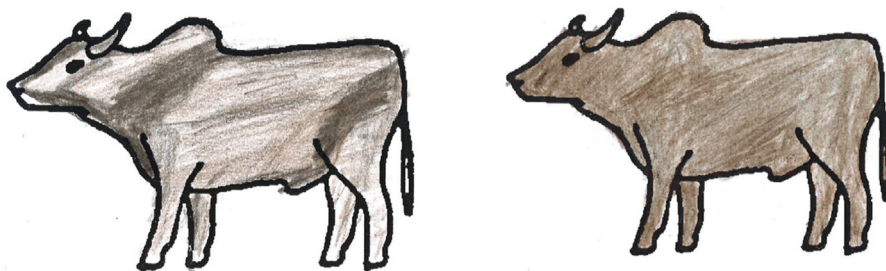

Fig. 13. silbí coat (left), morá coat (right).

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[11] Lydall did not provide the matching code for the colored chips which elicited the terms *deer* and *morá* in the color chip naming task; in a replication of the color chip naming task with two Hamar speakers, the term *morá* was used with the Color Aid Corporation cards OS 3, R S3, ROS3, GRAY 4, GRAY 6, SIENNA BROWN, BVB S3, Y S2, YO S3, YOY S2: these correspond to various hues in the domain brown/gray. The term *deer* was mostly associated with red hues: RO HUE, ROR HUE, ORO HUE, R HUE, RVR HUE.

In the pattern labeling task (see Fig. 14), the term *silbí* was used by a group of participants to refer to the alternation of red and black hues in striped patterns (see also §5.2 below for an explanation of the term *shóta* for stripes, and see Fig. 24 for another example of a colored pattern named *silbí* after the combination and stand-out effects of red and black elements).

The triangulation of the three tasks suggests that a term like *silbí* subsumes color-like qualities (red-brown-black), sheen (high saturation, glossy appearance), but also design qualities since the various colors and sheen are restricted to specific areas of the animal's coat; stand-out effects created by the combination of red and black hues are also described in terms of *silbí* (cf. Fig. 14 and Fig. 24a). In Hamar folk definitions the term *silbí* is used to describe the appearance of crystallized honey and some people's skin tones. According to Hamar speakers, *silbí* is one among the favorite coats for young Hamar herders because animals with a *silbí* coat can mimetize with the surrounding environment and have better chances of surviving wild animals when they get separated from the herd and get lost in the bush. Moreover, *silbí* hides are highly valued by Hamar women for their dark sheen, and they are preferred over other types of hides to prepare traditional leather skirts and cloaks. Thus *silbí*, a psychologically and culturally salient term of appearance in the Hamar visual system, cannot be defined only in terms of one inherent characteristic (like hue), but it receives its meaning also with respect to its visual conspicuousness and the contrast it creates with the surrounding environment.

Fig. 14. silbí (shóta) patterns.

The conversations that research participants had during the coat coloring task revealed also interesting aspects of the meaning of the term *morá* 'desaturated' and *t'iá* 'blackish'. During the task, grey, black, and brown pencils were referred to as *morá;* when research participants were asked to pick all the *morá* pencils, they selected all the shades of grey and brown and included the black pencil. When asked for clarifications, participants explained that the black pencil, if necessary, can be specifically referred to as *t'iá morá*. Next, participants were asked to show an example of a prototypical "black" (in Hamar language *t'iá imbá,* 'father black'), and they pointed first at the black border of the printed cow profile used in the coloring task; then they pointed at black cattle and goats; and eventually they provided as an example of prototypical black the mark produced by a black felt-tip marker. The black pencil did not qualify as *t'iá* because of the desaturation and lack of sheen, and for this reason it was referred to as *morá*. Similar outcomes were observed in the pattern naming task, where the black background of a pattern was not univocally referred to as *t'iá*, but rather as *morá*. It is not clear whether the background of these cards was named *morá* because of the matte finish on the printed laminated cards, or because of the overall visual effect produced by the combination of other colors and designs (see Fig. 15):

Fig. 15. The black background of the pattern cards above was described as morá "desaturated", rather than t'iá "blackish".

These observations suggest that (de)saturation and (lack of) sheen, rather than hue, are central to the meaning of at least some Hamar terms, especially in the tan-brown-grey-black domain. This can be generalized to the rich vocabulary of patterns and designs as well. In the Hamar experience there are visual aspects other than hue which are more salient: the Hamar pay attention to visually striking features and contrasts produced by the combination of (de)saturation, sheen and patterns, often regardless of hue. The saliency of visual features other than hue, such as brightness (see Levisen, 2019b) and visual conspicuousness has been reported and amply discussed in the literature, especially in the post–Berlin and Kay era of color studies, within the new paradigm of "visual semantics" initiated by Wierzbicka and Goddard (2014).

5.2. The importance of contrast and stand-out effects

Interesting insights into the conceptualizations of Hamar categories for appearance can be gathered by observing the way cattle appearance is mapped onto other types of visual experiences, for example clothes, fabrics, and beadwork.

A close comparison of the responses obtained in the pattern naming task shows that the Hamar classification system does not group together "stripes" and "dots" along the same principles which structure the Anglo concepts. When looking at the representation of "pattern" terms in the drawing task, their cattle-centered referential range in the coat naming task, and their extensional meaning for other types of visual experience (clothes and bead work), it becomes evident that what is

central to the meaning of these terms is not the geometrical shape of the elements forming a pattern, but rather the overall visual effects created by the combination of visual elements of different size, their regularity, and the contrast they create with the background. For instance, when a pattern made of small dots creates a stand-out effect similar to a pattern made of thin stripes, the two patterns are conceptualized under the same category, regardless of the geometrical units they are made of. This is explained by the fact that the principles at play in the Hamar visual system are anchored on cattle appearance. This point will be explained with three terms which are salient in the Hamar visual universe: *zargí* 'small spots', *bordí* 'large spots' and *shɔ́ta* 'patched'. The terms occur in free listing tasks, often among the first ten terms. The predominant preference in Hamar aesthetics for patterned clothes (over fabrics with solid colors) also points at the cultural and psychological saliency of the visual features anchored on the cattle model.

As the glosses suggest, these three terms are associated with spotted and patched coats. An example of patched coats was given in Fig. 1 above and it is repeated below in Fig. 16c for ease of reference, together with the two types of spotted coats referred to as *zargí* (Fig. 16a) and *bordí* (Fig. 16b).

The drawings produced in the coloring task reflect the difference between smaller and larger spots (cf. Fig. 16a and b with Fig. 17a and b). Patched coats are represented in the coloring task with horizontal lines (cf. Figs. 16c and 17c); colored patches on the body of an animal create a design in which two different colors can be seen as alternating; as it will be explained below, alternating colors which are referred to as "striped" patterns from an Anglo perspective, in Hamar are conceptualized as *shɔ́ta*.
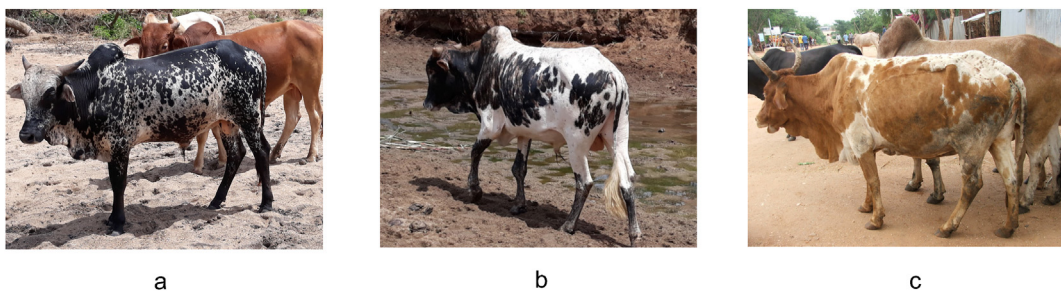

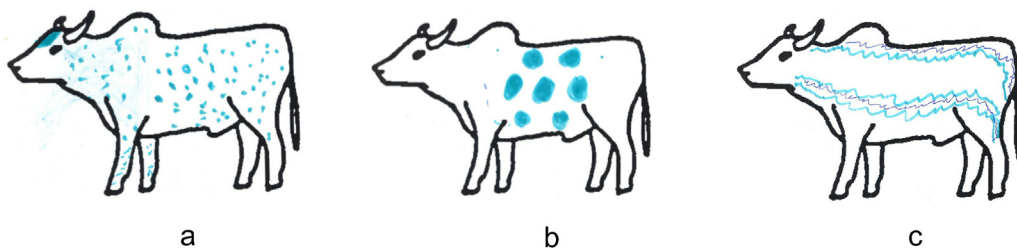**Fig. 16.** Small spots, 'zargí' (a); large spots, 'bordí' (b); patched, 'shɔ́ta' (c).

Fig. 17. Small spots, 'zargí' (a); large spots, 'bordí' (b); patched, 'shɔ́ta' (c).

The responses obtained with the pattern naming task show that the cards named *zargí* 'small spots' do not include only spots, but also small regular patterns of any shape including thin lines and squared patterns (see Fig. 18).

The cards named *bordí* include larger spots but also chequered patterns (see Fig. 19).

The categorization principles underlying the two types of appearance *bordi* and *zargí* have little to do with the geometrical shape of the elements making up a pattern; it seems rather that speakers pay attention to the visual conspicuousness and the stand-out effects created by lighter and darker contrasts. This can be seen by comparing for example Fig. 18f with Fig. 19b: in the latter, the visual space is predominantly occupied by black squares which stand out more compared to the empty squares in Fig. 18f.
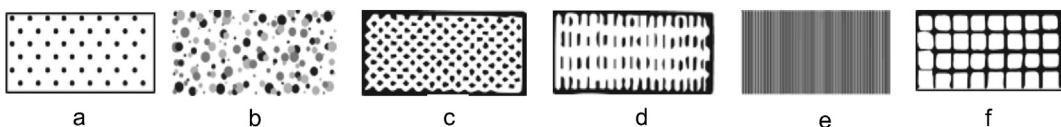

Fig. 18. Pattern cards categorized as zargí.

Fig. 19. Pattern cards categorized as bordí.

The term *shóta* was used to refer to patterns which would be labeled as "stripes" in the Anglo conceptual world. The term was used regardless of the direction and orientation of the stripes (Fig. 20). It is interesting to mention that the stripes on the coat of a zebra are not categorized as *shóta* in the Hamar visual system, but rather as *túrga,* a "pure" pattern term applied to zebra patterns and other types of strikes and brindled coats (see Fig. 4b for a representation of *túrga).* If the alternation between different colors is created by geometrical figures other than stripes (for example dark rectangles on a white background in Fig. 20d), the pattern is also referred to as *shóta.*

Fig. 20. Pattern cards categorized as 'shóta'.

The visual contrast on the pattern cards described as *shóta* consists of regular color alternations which are thicker than those classified as *zargí,* cf. Fig. 20 with Fig. 18. The card in Fig. 21 below was mostly labelled *shóta,* but some participants were hesitant between the terms *zargí* and *shóta*; this could be explained by the fact that the lines on the card in Fig. 21 are slightly thicker than those on the card referred to as *zargí* in Fig. 18e above, however the overall visual effect created by the alternating bright colors is similar to the stand-out effect associated with a *zargí* type of appearance:
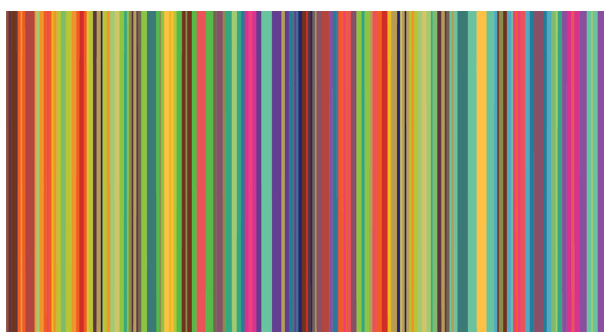

Fig. 21. Pattern card categorized as shóta or zargí.

For the pattern card in Fig. 21 some participants added the descriptor *ul(o)* 'bluesih' and *guitá* 'iridescent', terms which are used also to describe the appearance of the sky and the iridescence of some cattle coats.

If striped patterns showed larger white gaps among colors, as illustrated in Fig. 22 below, there was some hesitation among the participants in naming the pattern *shóta,* and some preferred the term *labál* 'white belly', suggesting that when a larger gap divides other colors in the visual space, it is conceptualized as the white underside patch on a coat (cf. Fig. 8 above for pattern cards named *labál):*

Fig. 22. Pattern card categorized as shóta or labál.

Additional observations of natural occurring conversations helped identify clothes and objects referred to as *zargí*, *bordí* and *shóta* in Hamar visual experience. Objects described as having *zargí* appearance display small regular patterns as those on the clothes and on the *aloe vera* species in Fig. 23 below.
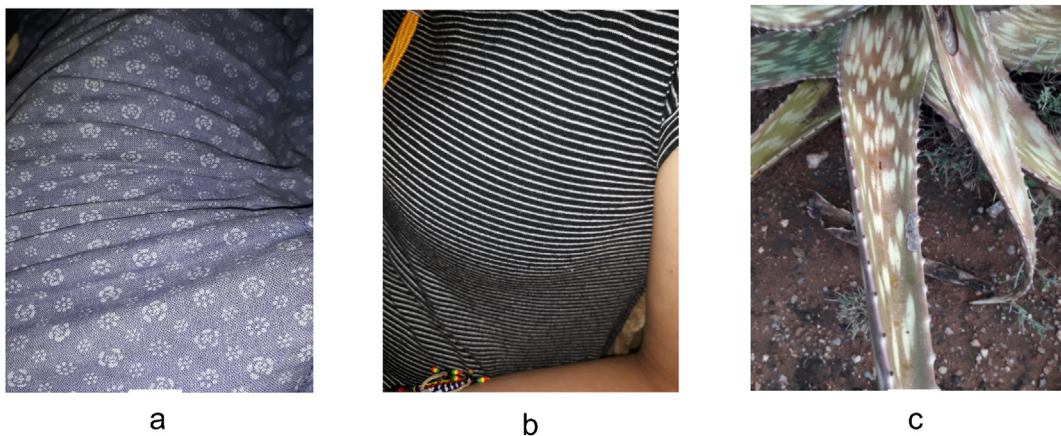

Fig. 23. Designs and patterns referred to as zargí.

The condition for a type of appearance to be named *zargí* is the overall stand-out effect and contrast created by a small regular pattern, rather than the shape of the geometrical units constituting a pattern (that is spots, lines etc.). This is the reason why a regular and small floral design like the one on the clothes in Fig. 23a, or the thin lines in Fig. 23b, are referred to as *zargí*.

Types of appearance referred to as *bordí* display larger irregular patterns, such as the design on the T-shirt in Fig. 24a below. The appearance of this T-shirt was described as *silbí bordí*: the term *bordi* refers to the irregular pattern created by the images of flowers, leaves and birds; the term *silbi* describes the stand-out effects created by predominant red and black hues, cf. §5.1). The hair-less spots among hairy spots on somebody's head are also referred to as *bordí* (Fig. 24b).
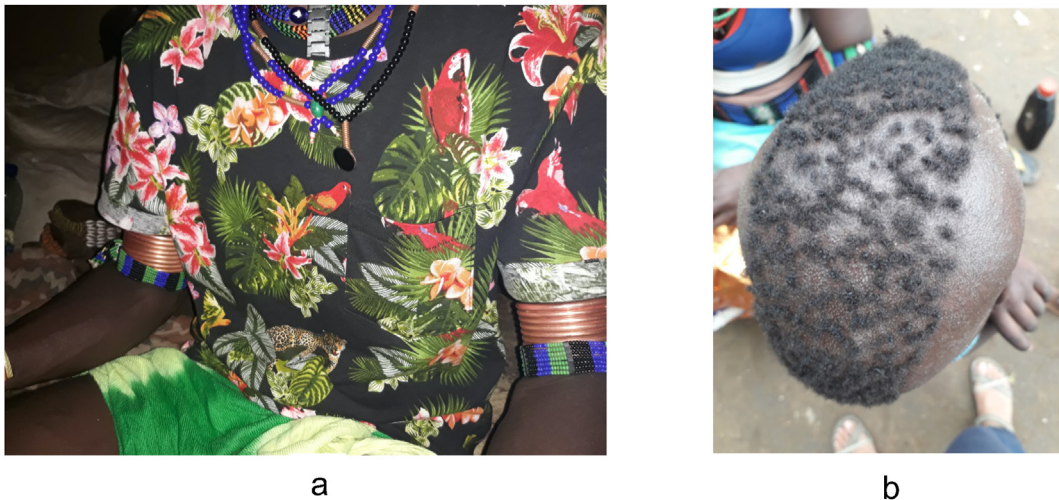
Fig. 24. A T-shirt (a) referred to as silbí bordí; alternation of hairy and hair-less spots (b) is also described as bordí.

Striped clothes and blankets (Fig. 25a and b) are usually described as *shɔ́ta*, so is the patchy sky (Fig. 25c), the alternation of brass and copper bracelets on somebody's arm (Fig. 25d), or a striped body painting motif (Fig. 25d):
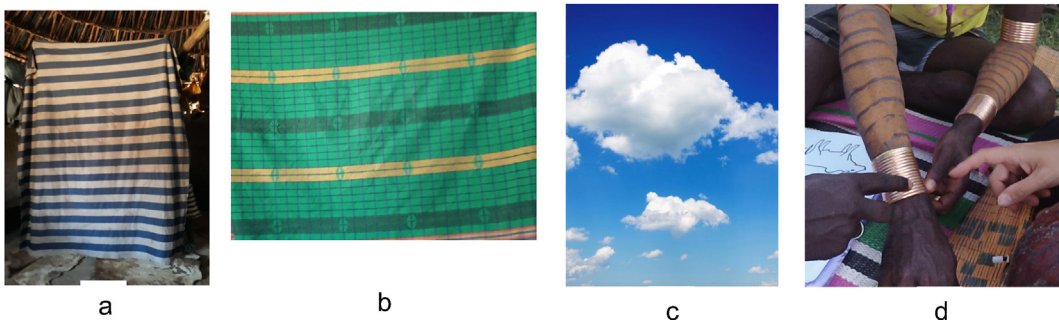

Fig. 25. Types of appearance referred to as shɔ́ta.

These examples suggest that the perceptible overall contrasts and stand-out effects, rather than features which are classified in English as dots, stripes, and other geometrical patterns, are central to the visual meanings of categories which have been referred to as "pattern" or "design" terms.

6. Conclusions

This paper has presented the preliminary results and the methodology developed for a comparative study of cattle appearance in pastoral cultures of East Africa. The proposed methodology consists of three main tasks: these were carried out in a monolingual Hamar setting and were used as semi-experimental tools and more "dialogic" techniques to support a traditional ethnolinguistic analysis.

The coat naming task provided an overview of the lexicon and the cattle-centered meaning, revealing the lexicalization and codability (i.e., the extent to which speakers agree on a term) of cattle appearance. The task was performed in a cross-sectional study and the results can be used in future research to make generalizations about dialectal variation, distribution of knowledge across sex and gender, and acquisition of the vocabulary for appearance by children.

The coloring task revealed the features which are diagnostic for a coat to be assigned to a specific category and highlighted the difference between "pure pattern" terms and "colored patterns".

The pattern naming task was developed to test the extensional use of terms for cattle appearance, and the results highlighted the properties which are central to the meaning of terms in the domain of geometric designs and patterns.

The study among the Hamar has shed light into the taxonomy of cattle appearance and how cattle appearance is mapped onto other domains of visual perception: the fact that abstract geometric patterns and designs are described in terms of cattle appearance strongly supports the view of a cattle model as a general framework which pastoralists apply in their visual experience of the world. The important role of non-chromatic qualities such as brightness, sheen and stand-out effects has emerged as well, providing further support for alternative visual systems other than the hue-centric systems which dominate the Anglo conceptual and linguistic world.

The stimuli and the tasks discussed in this paper can be re-used in an exploratory way and applied in other pastoral cultures, to reach a better understanding of this semantic domain, its categorization principles and means of linguistic expression.

Funding

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

References

Almagor, Uri, 1972. Name-oxen and ox-names among the Dassanetch of southwest Ethiopia. Paideuma 18, 79–96.

Almagor, Uri, 1978. Pastoral Partners: Affinity and Bond Partnership among the Dassanetch of South-West Ethiopia. University Press, Manchester.

Almagor, Uri, 1983. Colours that match and clash: an explication of meaning in a pastoral society. Res. Anthropol. Aesthet. 5, 49–73.

Arbab, Shabnam, Brindle, Jonathan A., Matusiak, Barbara S., Klöckner, Christian A., 2018. Categorisation of colour terms using new validation tools: a case study and implications. I-Perception 9 (2). https://doi.org/10.1177/2041669518760043, 2041669518760043.

Arensen, Jonathan E., 1992. Mice are Men: Language and Society among the Murle of Sudan. International Museum of Cultures, Dallas, Tex.

Barrett, Anthony, 1988. English-Turkana Dictionary. Macmillan Kenya, Nairobi, Hong Kong.

Beck, Jacob, 1972. Surface Color Perception. Cornell University Press, Ithaca [N.Y.].

Bender, M. Lionel, 1983. Color term encoding in a special lexical domain: Sudanese Arabic skin colors. Anthropol. Ling. 25 (1), 19–27.

Berlin, Brent, Kay, Paul, 1969. Basic Color Terms: Their Universality and Evolution. University of California Press, Berkeley, CA.

Berlin, Brent, Kay, Paul, Marrified, William, 1976. Instructions to Fieldworkers. World Colour Survey Archive. http://www1.icsi.berkeley.edu/wcs/images/WCS_instructions-20041018/jpg/border/index.html.

Bliese, Loren F., 1970. The lexicon-a key to culture: with illustrations from Afar word lists. J. Ethiop. Stud. 8 (2), 1–19.

Blommaert, Jan, 1985. The semantics of Bantu colour terms. Grazer Linguist. Stud. 24, 63–75.

Breedveld, Anneke, 1995. Form and Meaning in Fulfulde: A Morphophonological Study of Maasinankoore. CNWS/LDS Publications, Leiden. https://openaccess.leidenuniv.nl/handle/1887/68663.

Brindle, Jonathan, 2016. Color basicness in Chakali. In: Paulsen, Geda, Uusküla, Mari, Brindle, Jonathan (Eds.), Color Language and Color Categorization. Cambridge Scholars Publishing, Newcastle upon Tyne, England.

Buxton, J.C., 1973. Religion and Healing in Mandari. Clarendon Press, Oxford.

Caparos, Serge, Ahmed, Lubna, Bremner, Andrew J., de Fockert, Jan W., Linnell, Karina J., Davidoff, Jules, 2012. Exposure to an urban environment alters the local bias of a remote culture. Cognition 122 (1), 80–85. https://doi.org/10.1016/j.cognition.2011.08.013.

Caparos, Serge, Linnell, Karina J., Bremner, Andrew J., de Fockert, Jan W., Davidoff, Jules, 2013. Do local and global perceptual Biases tell us anything about local and global selective attention? Psychol. Sci. 24 (2), 206–212 https://doi.org/10.1177/0956797612452569.

Conklin, Harold C., 1955. Hanunóo color categories. SW. J. Anthropol. 11 (4), 339–344.

Davidoff, Jules, Fonteneau, Elisabeth, Goldstein, Julie, 2008. Cultural differences in perception: observations from a remote culture. J. Cognit. Cult. 8 (3–4), 189–209. https://doi.org/10.1163/156853708X358146.

Davies, I.R.L., Corbett, G., 1997. Colour categories in African languages: a test of the Berlin and Kay theory of colour universals. In: Herbert, Robert K. (Ed.), African Linguistics at the Crossroads: Papers from Kwaluseni, 1st WOCAL World Congress of African Linguistics, Swaziland 18-22. VII. 1994. Rüdiger Köppe Verlag, Köln, pp. 581–598.

Davies, Ian, Corbett, Greville, 1994. A statistical approach to determining basic colour terms: an account of Xhosa. J. Linguist. Anthropol. 4 (2), 175–193.

Davies, I.R.L., Macdermid, C., Corbett, G., Mcgurk, H., Jerrett, D., Jerrett, T., Sowden, P., 1992. Color terms in Setswana: a linguistic and perceptual approach. Linguistics 30 (6), 1065–1104. https://doi.org/10.1515/ling.1992.30.6.1065.

Davies, Ian, Corbett, Greville, McGurk, Harry, Jerrett, David, 1994. A developmental study of the acquisition of colour terms in Setswana. J. Child Lang. 21 (3), 693–712. https://doi.org/10.1017/S030500090000951X.

Davies, Ian, Corbett, Greville, Mtenje, Al, Sowden, Paul, 1995. The basic colour terms of Chichewa. Lingua 95 (4), 259–278. https://doi.org/10.1016/0024-3841(94)00024-G.

Davies, Ian R.L., Roling, Penny, Corbett, Greville G., Xoagub, Fritz, Xoagub, Jomo, 1997. Color terms and color term acquisition in Damara. J. Linguist. Anthropol. 7 (2), 181–207. https://doi.org/10.1525/jlin.1997.7.2.181.

de Garine, Éric, 2013. Contribution à l'ethnologie du taurin chez les Duupa: (Massif de Poli, Nord-Cameroun). In: Seignobos, Christian, Thys, Éric (Eds.), Des taurins et Des Hommes: Cameroun, Nigéria, Latitudes 23. IRD Éditions, Marseille, pp. 123–181. http://books.openedition.org/irdeditions/5407.

Dimmendaal, Gerrit J., 2015. Studying lexical-semantic fields in languages: nature versus nurture, or where does culture come into it these days?. In: The Leopard's Spots: Essays in Language, Cognition, and Culture. Brills, Leiden.

Dubosson, Jérôme, 2014. Human 'self' and animal 'other'. The favourite animal among the Hamar. In: Girke, Felix (Ed.), Ethiopian Images of Self and Other. Halle an der Saale.

Dubosson, Jérôme, 2016. Le bétail et sa représentation chez les pasteurs de l'Afrique du nord et de l'est. Une approche ethnoarchéologique. Unpublished PhD thesis. Université de Neuchâtel, Neuchâtel. https://libra.unine.ch/Publications/33869.

Dubosson, Jérôme, 2018. The Hamar: living by, for and with the cattle. In: Clack, Timothy, Brittain, Marcus (Eds.), The River: Peoples and Histories of the Omo-Turkana Area. Archaeopress Publishing Ltd, Oxford, pp. 125–132.

Dyson-Hudson, Neville, 1966. Karimojong Politics. Clarendon Press, Oxford.

Eades, Domenyk, Watson, Janet C.E., Al Mahri, Mohammed Ahmad, 2013. Camel culture and camel terminology among the Omani Bedouin. J. Semit. Stud. 58 (1), 169–186.

Eckl, E. Andreas, 1998. "Kognition Und Konzeptualisierung Am Beispiel Der Bezeichnungen Für Farben Und Musterungen von Rinderfellen Im Herero. Master's Thesis. University of Cologne, Institute of African Studies, Cologne.

Eckl, E. Andreas, 2000. Language, culture and environment. The conceptualization of Herero cattle terms. In: Bollig, M., Gewald, J.-B. (Eds.), People, Cattle and Land: Transformation of a Pastoral Society in Southwestern Africa, vol. 13. Rüdiger Köppe, Cologne, pp. 401–431. History, Cultural Traditions and Innovations in Southern Africa.

Eczet, Jean-Baptiste, 2013. Humains et Bovins En Pays Mursi (Éthiopie). Registres Sensibles et Processus de Socialité. Unpublished PhD thesis. École pratique des Hautes Études, Paris.

Eczet, Jean-Baptiste, 2018. Colours, metaphors and persons. In: Clack, Timothy, Brittain, Marcus (Eds.), The River: Peoples and Histories of the Omo-Turkana Area. Archaeopress Publishing Ltd, Oxford.

Eczet, Jean-Baptiste, 2019. Ceci n'est pas une couleur. L'Homme n° 230 (2), 117–132.

Evans-Pritchard, E.E., 1934. Imagery in Nɡok Dinka cattle-names. Bull. Sch. Orient Afr. Stud. 7 (3), 623–628. https://doi.org/10.1017/S0041977X00138340.

Evans-Pritchard, E.E., 1940. The Nuer: A Description of the Modes of Livelihood and Political Institutions of a Nilotic People. Clarendon Press, Oxford.

Fletcher, Robert, 1980. The City University Colour Vision Test. Keeler, Windsor, Berkshire.

Fockert, Jan W. de, Caparos, Serge, Linnell, Karina J., Davidoff, Jules, 2011. Reduced distractibility in a remote culture. PLos One 6 (10), e26337. https://doi.org/10.1371/journal.pone.0026337.

Fockert, Jan W. de, Davidoff, Jules, Fagot, Joel, Parron, Carole, Goldstein, Julie, 2007. More accurate size contrast judgments in the Ebbinghaus Illusion by a remote culture. J. Exp. Psychol. Hum. Percept. Perform. 33 (3), 738–742. https://doi.org/10.1037/0096-1523.33.3.738.

Fukui, Katsuyoshi, 1979. Cattle colour symbolism and inter-tribal homicide among the Bodi. In: Fukui, Katsuyoshi, Turton, David (Eds.), Warfare among East African Herders, pp. 147–177. Senri Ethnological Studies 3.

Fukui, Katsuyoshi, 1980. Color concepts and classification among the Bodi. Kokuritsu Minzokugaku Hakubutsukan Kenkyū Hōkoku = Bull. Natl. Museum Ethnol. 4 (4), 557–565.

Fukui, Katsuyoshi, 1986. The cognition of nature through colours and patterns: from cases of the Narim in Southern Sudan. In: Tomikawa, Morimichi (Ed.), Sudan Sahel Studies, vol. II. Institute for the Study of Languages and Cultures of Asia and Africa (ILCAA), Tokyo, pp. 207–235.

Fukui, Katsuyoshi, 1994. Why do people prefer diversified selection? Cattle coat-color and sorghum variation. Tropics 3 (1), 51–70. https://doi.org/10.3759/tropics.3.51.

Fukui, Katsuyoshi, 1996. Co-evolution between humans and domesticates: the cultural selection of animal coat-colour diversity among the Bodi. In: Ellen, Roy, Fukui, Katsuyoshi (Eds.), Redefining Nature: Ecology, Culture and Domestication. Berg, Oxford, pp. 319–385.

Galaty, John G., 1989. Cattle and cognition: aspects of Maasai practical reasoning. In: Clutton-Brock, Juliet (Ed.), The Walking Larder: Patterns of Domestication, Pastoralism, and Predation. World Archaeological Congres, Southampton/England, pp. 214–230.

Goldstein, Julie, Davidoff, Jules, 2008. Categorical perception of animal patterns. Br. J. Psychol. 99 (2), 229–243. https://doi.org/10.1348/000712607X228555.

Grimm, Nadine, 2012. Color categories in language contact: 'Pygmy' Hunter-Gatherers and Bantu farmers. Ann. Meet. Berkeley Linguist. Soc. 38 (September), 31. https://doi.org/10.3765/bls.v38i0.3320.

Gulliver, P.H., 1952. Bell-oxen and ox names among the Jie. Uganda J. 16, 72–75.

Gulliver, P.H., 1955. The family herds: a study of two pastoral tribes in East Africa: the Jie and Turkana. In: International Library of Sociology and Social Reconstruction. Routledge & Kegan Paul Ltd, London, 811131319.

Hangara, Ngungaa, 2019. Ozongombe Mombazu Ya Kaoko/Cattle in Kaoko Ovaherero Culture. University of Namibia Press.

Hansford, Gillian F., 2010. Red is a verb: the grammar of colour in Chumburung. J. W. Afr. Lang. 37 (2), 109–137.

Hazel, Robert, 1997. Robes colorées et cornes déformées: les pasteurs est-africains et leurs boeufs de parade. Anthropol. Soc. 21 (2–3), 67–85. https://doi.org/10.7202/015485ar.

Hess, J.J., 1920. Die Farbbezeichnungen Bei Innerarabischen Beduinenstämmen. Der Islam; Zeitschrift Für Geschichte Und Kultur Des Islamischen Orients 10, 74–86.

Infield, Mark, 2003. The Names of Ankole Cows. Fountain Publishers, Kampala.

Herskovits, Melville J., 1926. The cattle complex in East Africa. Am. Anthropol. 28 (1), 230–272.

Ishihara, Shinobu, 1972. Tests for colour-blindness. Kanehara Shuppan, Tokyo.

James, Wendy, 1988. The listening ebony: moral knowledge, religion, and power among the Uduk of Sudan. Clarendon Press, Oxford.

Kay, Paul, Regier, Terry, 2006. Language, thought, and color: recent developments. Trends in Cognitive Sciences 10 (2), 51–54. https://doi.org/10.1016/j.tics.2005.12.007.

Killian, Don, 2015. "Topics in Uduk Phonology and Morphosyntax. Doctoral Thesis. University of Helsinki, Department of World Cultures, Helsinki.

Koopman, Adrian, 2019. Zulu Bird Names and Bird Lore. University of KwaZulu Natal Press, Pietermaritzburg.

Koptjevskaja-Tamm, Maria, Rakhilina, Ekaterina, Vanhove, Martine, 2016. The semantics of lexical typology. In: Riemer, Nick (Ed.), The Routledge Handbook of Semantics, pp. 434–454.

Kuschel, Rolf, Monberg, Torben, 1974. We don't talk much about colour here': a study of colour semantics on Bellona Island. Man 9 (2), 213–242. https://doi.org/10.2307/2800075.

Last, Marco, 1995. A Sketch of Chai. M.A. Thesis. Leiden University.

Laws, Glynis, Davies, Ian, Corbett, Greville, Jerrett, Tiny, Jerrett, David, 1995. Colour terms in Setswana: the effects of age and urbanization. Lang. Sci. 17 (1), 49–64. https://doi.org/10.1016/0388-0001(95)00002-D.

Leus, Ton, Salvadori, Cynthia, 2006. Aadaa Boraana. A Dictionary of Borana Culture. Shama Books, Addis Ababa.

Levinson, Stephen C., Majid, Asifa, Enfield, N.J., 2007. Language of perception: the view from language and culture. Field Manual 10, 10–21. https://doi.org/10.17617/2.468738.

Levisen, Carsten, 2019a. Biases we live by: Anglocentrism in linguistics and cognitive sciences. Lang. Sci. (Oxford) 76, 101173. https://doi.org/10.1016/j.langsci.2018.05.010.

Levisen, Carsten, 2019b. 'Brightness' in color linguistics: new light from Danish visual semantics. In: Raffaelli, Ida, Katunar, Daniela, Kerovec, Barbara (Eds.), Lexicalization Patterns in Color Naming: A Cross-Linguistic Perspective. John Benjamins Publishing Company, Amsterdam, pp. 83–108.

Leyew, Zelealem, 2016. The description of colour terms in Ethiopian languages. E. Afr. Soc. Sci. Res. Rev. 32 (2), 53–86. https://doi.org/10.1353/eas.2016.0008.

Lienhardt, Godfrey, 1961. Divinity and Experience: The Religion of the Dinka. OUP, London.

Lindsey, Delwin T., Brown, Angela M., Brainard, David H., Apicella, Coren L., 2015. Hunter-gatherer color naming provides new insight into the evolution of color terms. Curr. Biol. 25 (18), 2441–2446. https://doi.org/10.1016/j.cub.2015.08.006.

Lindsey, Delwin T., Brown, Angela M., Brainard, David H., Apicella, Coren L., 2016. Hadza color terms are sparse, diverse, and distributed, and presage the universal color categories found in other world languages. I-Perception 7 (6). https://doi.org/10.1177/2041669516681807, 2041669516681807.

Louwrens, Louis J., Taljard, Elsabé, 2008. Cattle and cattle colour terminology in South Africa. Anthropol. S. Afr. 31 (3–4), 95–102.

Lydall, Jean, 1976. Hamer. In: Bender, M. Lionel (Ed.), The Non-Semitic Languages of Ethiopia, vol. 5. Michigan State University, pp. 393–438. Committee on Ethiopian Studies: Occasional Papers Series. East Lansing: East Lansing, Michigan: African Studies Center.

Lydall, Jean, 1978. Le symbolisme de couleurs dans le rituel Hamar. In: Tornay, Serge (Ed.), Voir et nommer le couleurs. Laboratoire d'ethnologie et de sociologie comparative, Nanterre, pp. 553–580.

Lydall, Jean, 1988. Gender, number and size in Hamar. In: Bechhaus-Gerst, Marianne, Serzisko, Fritz (Eds.), Cushitic Omotic: Papers from the International Symposium on Cushitic and Omotic Languages, Cologne, January 6-9, 1986. Helmut Buske Verlag, Hamburg, pp. 77–90.

Lydall, Jean, 2002. Having fun with ideophones: a socio-linguistic look at ideophones in Hamar, Southern Ethiopia. In: Yimam, Baye, et al. (Eds.), Ethiopian Studies at the End of the Second Millennium: Proceedings of the 14th International Conference of Ethiopian Studies, November 6-11, 2000, Addis Ababa, vol. 2. Inst. of Ethiopian Studies, Addis Ababa Univ, Addis Ababa, pp. 886–911.

Lydall, Jean, Strecker, Ivo, 1979a. The Hamar of Southern Ethiopia, 1: Work Journal. In: Arbeiten Aus Dem Inst. Für Völkerkunde Der Univ. Zu Göttingen. Klaus Renner Verlag, Hohenschäftlarn (Deutschland).

Lydall, Jean, Strecker, Ivo, 1979b. The Hamar of Southern Ethiopia, 2: Baldambe Explains. In: Arbeiten Aus Dem Inst. Für Völkerkunde Der Univ. Zu Göttingen. Klaus Renner Verlag, Hochenschäftlarn (Deutschland).

Lydall, Jean, Strecker, Ivo, 1979c. The Hamar of Southern Ethiopia, 3: Conversations in Dambaiti. In: Arbeiten Aus Dem Inst. Für Völkerkunde Der Univ. Zu Göttingen. Klaus Renner Verlag, Hochenschäftlarn (Deutschland).

Lucy, John A., 1997. The linguistics of 'color'. In: Hardin, C.L., Maffi, Luisa (Eds.), Color Categories in Thought and LanguageCambridge University Press, Cambridge, pp. 320–346. https://doi.org/10.1017/CBO9780511519819.015.

Maffi, Luisa, 1984. Somali colour terminology: an outline. In: Labahn, Thomas (Ed.), Proceedings of the Second International Congress of Somali Studies, University of Hamburg, August 1-6, 1983. Buske, Hamburg, pp. 299–312.

Maffi, Luisa, 1990. Somali color term evolution: grammatical and semantic evidence. Anthropol. Ling. 32 (3–4), 316–334.

Magnus, Hugo, 1880. Untersuchungen Über Den Farbensinn Der Naturvölker. Gustav Fischer, Jena.

Majid, Asifa, Levinson, Stephen C., 2007. The language of vision I: colour. In: Majid, Asifa (Ed.), Field Manual, vol. 10. Max Planck Institute for Psycholinguistics, Nijmegen, pp. 22–25.

Moñino, Y., 2004. Une autre conception des lumières: sur les noms des couleurs en Gbaya. In: Motte-Florac, Élisabeth, Guarisma, Gladys (Eds.), Du Terrain Au Cognitif : Linguistique, Ethnolinguistique, Ethnosciences : À Jacqueline M.C. Thomas, vol. 417. Peeters, Leuven. SELAF.

Nebel, Arthur, 1954. Dinka Dictionary. Verona Fathers.

Ohta, Itaru, 1986. Livestock individual identification among the Turkana: the animal classification and naming in the pastoral livestock management. Afr. Stud. Monogr. 8 (1), 1–69.

Ohta, Itaru, 1989. A classified vocabulary of the Turkana in Northeastern Kenya. Afr. Stud. Monogr. 10 (Supplementary Issue), 1–104.

Okombo, Duncan, 1994. The semantics of Dholuo colour terms. Edited by Duncan Okombo Afr. Arbeitspapiere 40 (Dec), 131–138.

Oosthuizen, Marguerite Poland, 1996. Uchibidolo: The Abundant Herds. A Descriptive Study of the Sanga-Nguni Cattle of the Zulu People, with Special Reference to Colour-Pattern Terminology and Naming-Practice. Unpublished PhD Thesis. University of Natal, Pietermaritzburg/Durban. http://hdl.handle.net/10413/8490.

Payne, Doris L., 2003. Maa color terms and their use as human descriptors. Anthropol. Ling. 45 (2), 169–200.

Payne, Doris L., 2020. Color term systems: genetic vs. areal distribution in sub-Saharan Africa. In: Vossen, Rainer, Dimmendaal, Gerrit J. (Eds.), The Oxford Handbook of African Languages. Oxford University Press, Oxford. https://doi.org/10.1093/oxfordhb/9780199609895.013.53.

Petrollino, Sara, 2016. A grammar of Hamar, a South-Omotic language of Ethiopia. Rüdiger Köppe, Köln.

Petrollino, Sara, 2019. Existential predication in Hamar. Nordic Journal of African Studies 28 (4).

Petrollino, Sara, 2020. Cattle appearance: stimuli and tasks. OSF. https://doi.org/10.17605/OSF.IO/BM3WR.

Petrollino, Sara, 2022. Naming practices as key to pastoral indigenous knowledge system: Hamar titles and cattle classification. In: Sambulo, Ndlovu (Ed.), Personal names and naming from an anthropological linguistic perspective. De Gruyter. Submitted for publication.

Poland, Marguerite, Hammond-Tooke, David, Voigt, Leigh, 2004. The Abundant Herds: A Celebration of the Cattle of the Zulu People. Vlaeberg, Fernwood.

Pollnac, Richard B., 1975. Intra-cultural variability in the structure of the subjective color lexicon in Buganda. Am. Ethnol. 2 (1), 89–109. https://doi.org/10.1525/ae.1975.2.1.02a00050.

Prasse, Karl-G., 1999. Berber color terms. In: Borg, Alexander (Ed.), The Language of Color in the Mediterranean: An Anthology on Linguistic and Ethnographic Aspects of Color Terms. Almqvist & Wiksell, Stockholm, pp. 167–174. Stockholm Oriental Studies 16.

Rottland, Franz, 1982. Die Südnilotischen Sprachen : Beschreibung, Vergleichung Und Rekonstruktion. Dietrich Reimer, Berlin.

Rottland, Franz, 1994. Cattle-naming in North-Central Tanzania: a case of Borrowing. In: Sprachen Und Sprachzeugnisse in Afrika. Eine Sammlung Philologischer Beiträge, Wilhelm J.G. Möhlig Zum 60. Geburtstag Zugeeignet.

Rottland, Franz, Mous, Maarten, 2001. Datooga and Iraqw: a comparison of subsistence vocabulary. In: Ibriszimow, Dymitr, Leger, Rudolf, Seibert, Uwe (Eds.), Von Ägypten Zum Tschadsee: Eine Linguistische Reise Durch Afrika: Festschrift Für Herrmann Junraithmayr Zum 65 Geburtstag. Deutsche Morgenländische Gesellschaft, Heidelberg & Würzburg, pp. 377–400.

Roulon-Doko, Paulette, 2019. Lexicalization patterns in color naming in Gbaya, a Ubanguian language of CAR. In: Lexicalization Patterns in Color Naming: A Cross-Linguistic Perspective, pp. 133–156.

Saunders, Barbara Ann Christine, van Brakel, J., 1997. Colour: an exosomatic organ? Behav. Brain Sci. 20 (2), 212–220 https://doi.org/10.1017/S0140525X97531426.

Saunders, Barbara Ann Christine, 1992. The Invention of Basic Colour Terms. R.U.U.-I.S.O.R, " Utrecht.

Schultze, Leonhard Sigmund, 1907. Aus Namaland und Kalahari. Bericht an die Kgl. preuss. akademie der wissenschaften zu Berlin über eine forschungsreise im westlichen und zentralen Südafrika, ausgeführt in den jahren 1903-1905. Jena, G. Fischer. http://archive.org/details/ausnamalandundk00berlgoog.

Segerer, Guillaume, Vanhove, Martine, 2019. Color naming in Africa. In: Raffaelli, Ida, Katunar, Daniela, Kerovec, Barbara (Eds.), Lexicalization Patterns in Color Naming: A Cross-Linguistic Perspective. John Benjamins Publishing Company, Amsterdam ; Philadelphia, pp. 287–331. https://doi.org/10.1075/sfsl.78.13seg.

Seligman, Charles Gabriel, 1965. Pagan Tribes of the Nilotic Sudan. Routledge & Kegan Paul, London.

Storch, Anne, Vossen, Rainer, 2007. Odours and colours in Nilotic – comparative case studies. In: Payne, Doris L., Mechthild, Reh (Eds.), Advances in Nilo-Saharan Linguistics: Proceedings of the 8th Nilo-Saharan Linguistics Colloquium, University of Hamburg, August 22–25, 2001. Rüdiger Köppe Verlag, Köln.

Storch, Anne, 2005. The Noun Morphology of Western Nilotic. Nilo-Saharan. Linguistic Analyses and Documentation 21. Köppe, Köln.

Taljard, Elsabé, 2015. Cattle and their colours: a synchronic investigation of cattle colour terminology in Northern Sotho. S. Afr. J. Afr. Lang. 35 (2), 199–205. https://doi.org/10.1080/02572117.2015.1113006.

Tomikawa, Morimichi, 1972. Cattle Brands of the Datoga: human relations in the Datoga pastoral society in East Africa. Kyoto Univ. Afr. Stud. 7, 1–36.

Tornay, Serge, 1973. Langage et perception. La dénomination des couleurs chez les Nyangatom du Sud-Ouest éthiopien. Homme 13 (4), 66–94. https://doi.org/10.3406/hom.1973.367381.

Tornay, Serge (Ed.), 1978. Voir et nommer les couleurs. Laboratoire d'ethnologie et de sociologie comparative, Nanterre.

Tosco, Mauro, 1999. The color terms of Dhaasanac. In: Lamberti, Marcello, Tonelli, Livia (Eds.), Afroasiatica Tergestina. Papers from the 9th Italian Meeting of Afroasiatic (Hamito – Semitic) Linguistics. Unipress, Padova, pp. 381–392.

Tosco, Mauro, 2001. The Dhaasanac Language : Grammar, Texts and Vocabulary of a Cushitic Language of Ethiopia. Rüdiger Köppe, Köln.

Turton, David, 1978. La categorisation de la couleur en Mursi (ethiopie). In: Tornay, Serge (Ed.), Voir et Nommer Les Couleurs. Laboratoire d'ethnologie et de sociologie comparative, Nanterre, pp. 347–368.

Turton, David, 1980. There's no such beast: cattle and colour naming among the Mursi. Man 15 (2), 320–338. https://doi.org/10.2307/2801674.

Umesao, Tadao, 1966. Families and herds of Datoga pastoral society: an analysis of the cattle system. Kyoto Univ. Afr. Stud. 1, 173–206.

van Beek, Wouter E.A., 1977. Color terms in Kapsiki. In: Newman, Paul, Newman, Roxana Ma (Eds.), Papers in Chadic Linguistics. Afrika-Studiecentrum, Leiden, pp. 13–20.

van Brakel, J., 1993. The plasticity of categories: the case of colour. Br. J. Phil. Sci. 44, 103–135.

van Staden, M., Majid, A., 2006. Body colouring task. Lang. Sci. 28. https://doi.org/10.1016/j.langsci.2005.11.004.

Watson, Janet Constance Elizabeth, 1996. Lexicon of Arabic Horse Terminology. Kegan Paul International, London distrib. by Columbia University Press.

Wescott, Roger W., 1970. Bini color terms. Anthropol. Ling. 12 (9), 349–360.

Whiteley, W.H., 1973. Colour-words and colour-values: the evidence from Gusii. In: Finnegan, Ruth, Horton, Robin (Eds.), Modes of Thought in Western and Non-Western Societies. Wipf and Stock Publishers, Eugene, Oregon, pp. 145–161.

Wierzbicka, Anna, 1990. The meaning of color terms: semantics, culture, and cognition. Cognit. Ling. 1 (1), 99–150. https://doi.org/10.1515/cogl.1990.1.1.99.

Wierzbicka, Anna, 2005. There are no 'color universals' but there are universals of visual semantics. Anthropol. Ling. 47 (2), 217–244.

Wierzbicka, Anna, 2008. Why there are no 'colour universals' in language and thought. J. Roy. Anthropol. Inst. 14 (2), 407–425.

Wierzbicka, Anna, 2013. Imprisoned in English: The Hazards of English as a Default Language. Oxford University Press, Oxford.

Wierzbicka, Anna, 2018. Deconstructing 'colour', exploring indigenous meanings. In: (Diana Jane Barbara) editor Young, Diana (Ed.), Rematerializing Colour: From Concept to Substance. Sean Kingston Publishing, Canon Pyon.

Wierzbicka, Anna, Goddard, Cliff, 2014. Words and Meanings: Lexical Semantics across Domains, Languages, and Cultures. Oxford University Press, Oxford.

Wolf, Paul de, 1985. On the semantics of descriptive cattle names in Fulani. Afr. Arbeitspapiere 3, 37–49.

Wymeersch, Patrick, 1988. Turkana cattle classification: some preliminary Notes. Afr. Arbeitspapiere 16, 123.