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## RESEARCH ARTICLE

## Objects as culture-specific referents of color terms in Russian

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**Abstract**

The present study is an extension of our analysis of Russian basic color terms (BCTs) elicited in a web-based psycholinguistic experiment. Color samples ( $N = 600$ ) were approximately uniformly distributed in the Munsell color solid. An unconstrained color-naming method was employed. Native Russian speakers ( $N = 713$ ; 333 males) participated in the study. Among 1422 elicited unique color words, 698 terms (49%) were derived from object names. Here we explore object-derived non-BCTs, focusing on broad classes of names referred to objects, categories within these, and the inventory of color terms, as well as their frequency, patterns of derivation, and derivational productivity. Six classes of object referents were identified: flora, fauna, inanimate nature, food and beverages, man-made objects, body and bodily products. In detail, 20 most frequent object-derived terms are reported. These are accompanied by analysis of gender differences and representation of the terms' denotata on the Munsell Mercator projection. In addition, Russian object-derived color terms are related to those in English; discussed are differences between the 2 languages in the color term classes, inventories and incidences. We conclude that Russian object-derived color terms follow the generic metonymy pattern, that is, signifying color of objects in the speakers' natural environment. The inventory is also language-specific, reflecting social practices, preferences and views entrenched in the traditional Russian culture. Furthermore, recent extensive development of the inventory signals 2 novel phenomena: marked globalization influence, surfacing as abundant transliteration of English referent loanwords, and noticeable sociolectal diversification that manifests itself by novel evocative color terms, particularly in marketing and advertisement.

**KEYWORDS**

culture-specific referents, Munsell color sample, object-derived color terms, Russian, web-based experiment

**1 | INTRODUCTION**

Description of color by means of naming objects, which possess this color, is a universal feature of existing languages.<sup>1–10</sup> Color names develop metonymically, whereby “Entity stand for entity's color”, quoting Casson.<sup>11,12</sup> The phenomenon can be illustrated by English adjectives *gold* (made of gold) and *golden* (appearing made of gold) and numerous non-basic color terms such as *rose*, *flesh*, *peach*, *maroon*<sup>13–16</sup> or, in German, by *reseda* “mignonette”, *türkis* “turquoise”, *aubergine* “eggplant”.<sup>17</sup>

In these cases, the perceived color is conveyed based on the relation of similarity. As a rule, language speakers compare the color in question with certain prototypes available in the natural environment, for instance, with objects in fauna, flora, or other material objects, as well as with various artifacts, but also with social and cultural phenomena. Such color names may be “creative” or “conventional”,<sup>12</sup> but in both cases is governed by specific economic and cultural influences (eg, development in technology and industry, invention and import of new products, changes in fashion and media).<sup>17–20</sup>

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Within the social-psychology approach to the color-object relationship, a color prototype is an idealized stereotype, which is a realization of (1) normative understanding of qualities and properties of color and (2) specific features of prototypical objects. Usually prototypes exist in language as set comparisons (eg, *lime-green*, *navy-blue*, and *salmon-pink*) but, in theory, any idea or image can become a prototype.

Following the pioneer work on color terms and concepts and development of prototype theory by Rosch (Heider),<sup>21</sup> the structure of semantic categories of color names is known to be differential, with the explicit nucleus, the prototype, and the periphery, with members varying in the degree of their similarity to the prototype. The category periphery is organized in a looser way and constantly grows by adding new referents—“marketing” colors formed on the basis of prototypes, comparisons with, for instance, new food items, exotic flowers and animals, spices and fruit, construction and building materials.<sup>11–14,17,21</sup>

In Russian, as in other languages, a significant number of color terms are derived from names of objects and constitute a substantial part of the elaborated color names.<sup>22–31</sup> According to linguistic analysis based on the *Russian National Corpus* (<http://ruscorpora.ru/index.html>), common for native Russian speakers are colored-object referents from certain categories, specifically: fruits and berries; artifact fluids; dyes and pigments; gems and semi-precious stones.<sup>22,32–34</sup> These categories are similar to those for speakers of other languages, although the prevalence of the reference categories and their “population” by the terms derived from specific objects vary (cf., English<sup>11–14</sup> or German<sup>17</sup>), revealing natural- and cultural-environment dependent differences even between Russian and Polish, that is, languages of the same group (Slavic).

From a diachronic perspective, in Russian, an emerging object-derived color term enters initially as the pattern *cveta X* “color of X”.<sup>22,35,36</sup> In modern Russian, examples of this pattern are *cveta spelej višni* “color of a ripe cherry” or *cveta mokrogo asfalta* “color of wet asphalt”. The ensuing entrenchment of the color meaning of the referent object manifests itself by

developing of a proper adjectival derivative *X-yj*, followed by emancipation of color denotation from other object meanings. Typical examples of these are Russian denominal adjectives *malinovyj* “raspberry-colored” or *kirpičnyj* “brick-colored”.

In the present web-based study with access to an extensive sample of native Russian speakers, we employed a psycholinguistic method to investigate further the gamut of object referents of Russian color terms and to identify categories of object referents that are culture-specific, that is, reflect Russians' natural environment, as well as social practices and cultural context. The results are an extension of our previous analysis of the same dataset,<sup>1</sup> which focused primarily on Russian basic color terms (BCTs) and their (denotative) comparison with the English counterparts.

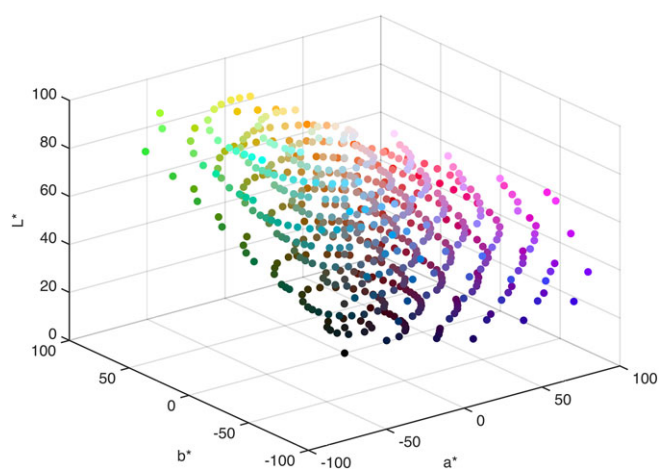
## 2 | METHODS

### 2.1 | Web-based experiment interface

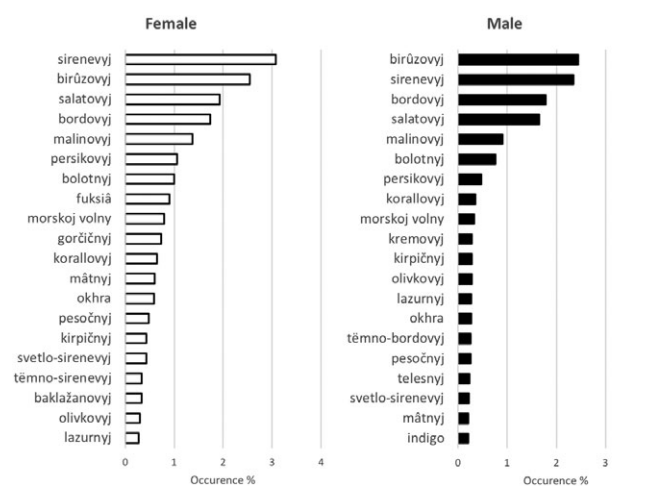
Detailed information on the interface of the web-based psycholinguistic experiment (<http://www.colourmaming.com>) can be found in our previous works.<sup>1,2</sup> A subset of the Munsell Renotation Data set was employed ( $N = 600$  in total) specified in sRGB (Figure 1). The Munsell system was selected because it fairly well represents perceptual judgments of just noticeable (threshold) differences in color and its underlying 5-color model corresponds well with empirical data on supra-threshold measures of color dissimilarity.<sup>37</sup> For naming colors, an unconstrained color-naming method was used.

### 2.2 | Data analysis

The raw sample consisted of 17 300 responses from 865 Russian speakers, of whom 15 720 (90.9%) resided in Russia. From further analyses we excluded responses of non-native Russian speakers and of those who failed the color vision test, as well as responses with incomplete and/or



**FIGURE 1** Six hundred stimuli of the color-naming experiment constrained by the sRGB gamut, plotted in CIE  $L^*a^*b^*$  space



**FIGURE 2** Percentage of occurrence of 20 most frequent Russian object-derived color names elicited in females (left) and males (right)

TABLE 1 Classes of objects functioning as color-term referents

Object classes	Number of objects	Number of derivates	Percentage of cases (%)
Flora	67	237	11.02
Inanimate nature	57	218	7.69
Man-made objects	49	116	2.22
Food and beverage	23	84	3.47
Fauna	10	19	0.19
Body and bodily products	9	24	0.36
<b>Total</b>	<b>215</b>	<b>698</b>	<b>24.95</b>

numerical terms. After this filtering a refined dataset included 14 260 responses from 713 observers (380 females and 333 males), with mean age of 22.87 years (ranging from 16 to 64). Nearly all participants reported to have Russian nationality (96.2%). Several participants—Russian native speakers—reported to be born in the former Soviet republics (Kazakhstan, Ukraine, Armenia, Kyrgyzstan, Turkmenistan, Uzbekistan, Estonia, Belarus, and Moldova) or Poland; the majority of them were bilingual (2.4% from the total number of participants).

The respondents had different levels of education: 47.1% did not have a university degree; other reported a Bachelor's (38.0%), Master's (11.6%), or Doctoral (2.5%) degree. The overwhelming majority of the participants (71.5%) described their experience working with color as that of beginners; 24.5% reported an intermediate level, while only 3.9% indicated that they were color professionals.

Observers entered their responses using the Cyrillic alphabet. The so elicited Russian color names were transliterated into Latin letters using a free online transliterator <http://translit.cc/>.

Among 1422 unique color words we identified 698 terms (49%) derived from names of objects. Note that basic color terms *fioletovyj* “purple”, *rozovyj* “pink” and *koričnevyyj* “brown” were excluded from the analysis: Although object-derived when they had entered Russian (18th century), in modern Russian they are deeply entrenched, with the meaning emancipated from the original object referents.

Among object-derived color terms, we (1) identified most frequent ones and estimated their occurrences; (2) identified

categories of objects, functioning as color-term referents; and (3) estimated derivational productivity, that is, the number of unique monolexemic and polylexemic descriptors derived from each object name, and frequency of each descriptor's occurrence. In addition, we compared inventories of females and males.

### 3 | RESULTS AND DISCUSSION

#### 3.1 | Frequent object-derived color terms in Russian

All data presented below in graphic and tabular form refer to the corpus of Russian color terms obtained in our large-scale study.<sup>1</sup> The most frequent object-derived color names were *sirenevyyj* “lilac” and *birûzovyj* “turquoise” (Figure 2). As shown in our previous study,<sup>1</sup> both color terms were the only 2 non-BCTs in the list of 10 most frequent color terms offered by Russian speakers, along with 8 BCTs. For females, *sirenevyyj* “lilac” and *birûzovyj* “turquoise”, occurred in the 7th and 9th positions, respectively, and for males in 10th and 9th positions. Noteworthy, counterparts of these terms are also among the most frequent non-BCTs in American English, *lavender* and *teal*, respectively,<sup>38</sup> and in British English, *lilac* and *turquoise*, respectively.<sup>39</sup>

The next 5 most frequent object color names (ranks 3-7) are *salatovyj* “lettuce-colored”, *bordovyj* “claret”, *malinovyj* “raspberry”, *persikovyyj* “peach”, and *bolotnyj* “marsh-colored”, for both Russian females and males, although the ranking order differs slightly between genders.

The inventory of other most frequent color names (ranks 8-20) includes, as expected, highly frequent terms *morskoj volny* “sea wave”, *olivkovyyj* “olive”, *okhra* “ocher”, *pesočnyj* “sand-colored”, *kirpičnyj* “brick-colored”, *mâtnyyj* “mint-colored”, *lazurnyyj* “azure” and others. It reveals though also gender differences: 4 terms in women's lexicon, *fuksiâ* “fuchsia” (rank 8), *gorčičnyj* “mustard-colored” (rank 10), *tëmno-sirenevyyj* “dark lilac” (rank 17), and *baklažanovyj* “eggplant-colored” (rank 18), were not among the most frequent terms used by men. Conversely, 4 terms, *kremovyj* “creamy”, *tëmno-bordovyj* “dark claret”, *telesnyj* “flesh-colored”, and *indigo* “indigo”, were high in frequency for men (ranks 10, 15, 17, and 20, respectively), but did not occur among women's frequent names.

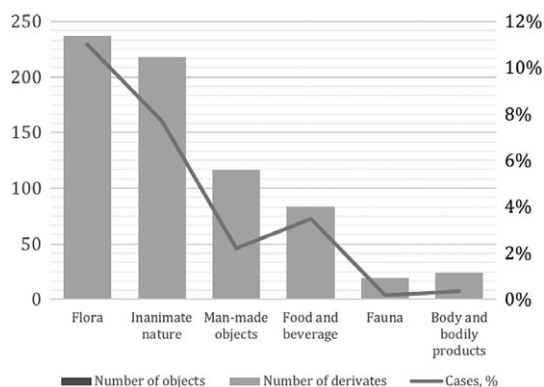


FIGURE 3 Number of objects and derivates in individual classes (left axis) and percentage of occurrence of object-derived color names elicited in each class (right axis)

TABLE 2 Categories of objects referred to in Russian color terms

Class	Category	Number of objects	Number of derivates	Percentage of cases (%)
Flora	Plants	19	52	0.93
	Flowers	16	67	4.34
	Fruits	12	54	2.10
	Vegetables	9	50	3.50
	Berries	8	17	0.27
	Nuts	3	14	0.47
Inanimate nature	Natural objects and substances	23	100	2.75
	(Semi-)precious stones	13	61	4.06
	Chemical elements and compounds	10	17	0.15
	Milieu	7	25	0.53
	Metals	4	15	0.19
Man-made objects	Dyes and pigments	10	39	1.16
	Artifacts	10	20	0.25
	Advertisement	10	11	0.08
	Fabrics	7	8	0.06
	Cosmetics	7	8	0.07
	Building materials	5	30	0.60
Food and beverages	Sweets	6	14	0.32
	Alcohol	5	29	2.23
	Dairy products	4	17	0.23
	Spices	4	16	0.54
	Hot and soft drinks	4	8	0.15
Fauna	Birds	5	7	0.05
	Mammals	4	4	0.03
	Fish	1	8	0.11
	Body and bodily products	9	24	0.36
<b>Total</b>		<b>215</b>	<b>698</b>	<b>24.95</b>

It is worth noting that high frequency and elicitation rank of *sirenevij*, *malinovij*, *salatovij*, *bolotnyj*, and *morskoj volny* was found earlier by Davies and Corbett<sup>40</sup> and more recently also for native Russian speakers in Estonia.<sup>41,42</sup> Further, in our study, the list of the most frequent object-derived color terms offered by Russian speakers includes terms with achromatic modifiers *svetlo*- “light” and *tëmno*- “dark” in combination with *sirenevij* “lilac” and *bordovij* “claret”, the

finding in accord with that of the Estonian group of linguists.

### 3.2 | Classes and categories of objects functioning as color-term referents

In the present data we focused on specific categories of objects, functioning as color-term referents (Table 1 and Figure 3), and grouped them into the 6 following classes<sup>22,32–34</sup>:

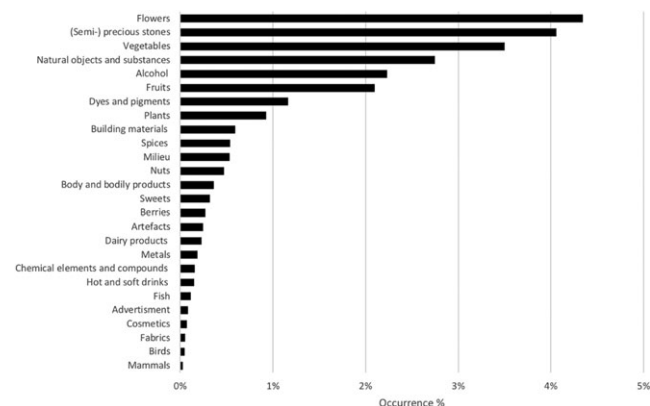


FIGURE 4 Percentage of occurrence of objects from different categories in Russian color terms

1. **Flora:** fruits, berries, vegetables, nuts, herbs, flowers;
2. **Fauna:** fish, animals, birds;
3. **Inanimate nature:** natural objects, natural substances, milieu, precious and semiprecious stones, metals, chemical elements and compounds, pigments, and colorants;
4. **Food and beverages:** sweets, spices, dairy products, alcohol, and hot and soft drinks;
5. **Man-made objects:** constructing and building materials, artifacts, fabrics, cosmetics, and advertisement;
6. **Body and bodily products.**

Note that such division into semantic categories is not exclusive to Russian. Similar classes and categories of

TABLE 3 Flora referents in Russian color terms

	In both samples	Only by female	Only by male
Plants	<i>derevo</i> “wood” <i>máta</i> “mint” <i>mokh</i> “moss” <i>palevyj</i> “straw” <i>sosna</i> “pine” <i>trava</i> “grass” <i>zelen</i> “potherbs”	<i>soloma</i> “straw” <i>tina</i> “slime” <i>vodorosl</i> “algae”	<i>anželika</i> “Angelica” <i>les</i> “forest” <i>jel</i> “spruce” <i>lipa</i> “linden” <i>listva</i> “foliage” <i>paprotnik</i> “fern” <i>pšenica</i> “wheat” <i>tabak</i> “tobacco” <i>veresk</i> “heather”
Flowers	<i>čertopolox</i> “thistle” <i>fialka</i> “violet” <i>fuksiá</i> “fuchsia” <i>geliotrop</i> “heliotrope” <i>lavanda</i> “lavender” <i>siren</i> “lilac” <i>vasilěk</i> “cornflower”	<i>cikorij</i> “chicory” <i>floks</i> “phlox” <i>kolokol'čik</i> “campanula” <i>krokus</i> “crocus” <i>nezabudka</i> “forget-me-not” <i>orkhideá</i> “orchid” <i>petunija</i> “petunia” <i>raps</i> “rapeseed” <i>roza</i> “rose”	<i>amarant</i> “amaranth” <i>mak</i> “poppy”
Fruits	<i>ábloko</i> “apple” <i>abrikos</i> “apricot” <i>apel'sin</i> “orange” <i>granat</i> “pomegranate” <i>gruša</i> “pear” <i>lajm</i> “lime” <i>limon</i> “lemon” <i>olivka</i> “olive” <i>persik</i> “peach” <i>sliva</i> “plum”	<i>banan</i> “banana” <i>mandarin</i> “tangerine”	
Vegetables	<i>baklažan</i> “eggplant” <i>morkov</i> “carrot” <i>salat</i> “lettuce” <i>sparža</i> “asparagus” <i>svěkla</i> “beetroot”	<i>pomidor, tomat</i> “tomato”	<i>kapusta</i> “cabbage” <i>redis</i> “radish” <i>tykva</i> “pumpkin”
Berries	<i>malina</i> “raspberry” <i>višná</i> “cherry”	<i>ágoda</i> “berry” <i>brusnika</i> “cowberry” <i>černika</i> “blueberry” <i>eževika</i> “blackberry” <i>klubnika</i> “strawberry” <i>vinograd</i> “grape”	
Nuts	<i>fistaška</i> “pistachio” <i>kaštan</i> “maroon” <i>orex</i> “nut”		

objects are semantically well justified and defined, to our knowledge, also in English,<sup>10,11,43</sup> German,<sup>17</sup> Polish,<sup>23</sup> and Ukrainian.<sup>43</sup>

If a color name contained several object names, it was classified in more than 1 category. For example, the color name *utrennij vodopad* “morning waterfall” was included into the categories of both “Natural objects” and “Milieu”.

Among the object categories of color-term referents most common for Russian speakers were flowers, gems and semi-precious stones; followed by vegetables, natural objects and substances, alcohol and fruits (Table 2 and Figure 4).

### 3.3 | Inventory of object referents in Russian color terms: females versus males

The inventory of object referents was further analyzed with regard to gender differences in the repertory of color names (Tables 3–8).

### 3.4 | Derivational productivity of Russian object names in color terms

Prompted by the unconstrained method, respondents produced multiple combinations of monolexic terms with modifiers or with varying suffixation, as well as compound terms.

The most frequent object-derived color names *sirenevyy* “lilac” and *birúzovyy* “turquoise” also revealed the richest derivational productivity (eg, *neonovyy sirenevyy* “neon lilac” or *bledno-birúzovyy* “pale turquoise”).

The list of 10 objects with the greatest derivational productivity offered by Russian females includes 3 “edible” referents: *moloko* “milk” (rank 5), *persik* “peach” (rank 7) and *gorčica* “mustard” (rank 10), that are not in the men's list (Figure 5). Conversely, males' list only includes variations of terms referring to colors of natural substances and building materials: *pesok* “sand”, *nebo* “sky”, and *kirpič* “brick”.

The color-name derivatives were produced using the following patterns of word formation:

TABLE 4 Inanimate nature referents in Russian color terms

	In both samples	Only by female	Only by male
Natural objects and substances	<i>boloto</i> “swamp” <i>morskaâ volna</i> “sea wave” <i>more</i> “sea” <i>laguna</i> “lagoon” <i>luna</i> “moon” <i>ultrafiolet</i> “ultraviolet” <i>pesok</i> “sand” <i>grâz</i> “mud” <i>zemlâ</i> “earth” <i>glina</i> “clay” <i>akva</i> “aqua”	<i>pena</i> “foam” <i>sneg</i> “snow”	<i>ravnina</i> “plain” <i>pustynâ</i> “desert” <i>pampasy</i> “pampas” <i>vodopad</i> “waterfall” <i>solnce</i> “sun” <i>voda</i> “water” <i>léd</i> “ice” <i>grifel</i> “lead” <i>grafit</i> “graphite” <i>aspid</i> “shungite”
(Semi-) precious stones	<i>birûza</i> “turquoise” <i>izumrud</i> “emerald” <i>ametist</i> “amethyst” <i>akvamarin</i> “aquamarine” <i>perlamutr</i> “nacre” <i>slonovaâ kost</i> “ivory” <i>korall</i> “coral”	<i>rubin</i> “ruby” <i>nefrit</i> “jade” <i>žemčug</i> “pearl” <i>mramor</i> “marble”	<i>malakhit</i> “malachite” <i>brilliant</i> “diamond”
Chemical elements and compounds	<i>neon</i> “neon” <i>ržavčina</i> “rust”	<i>myšák</i> “arsenic” <i>mentol</i> “menthol” <i>kobal't</i> “cobalt”	<i>margancovka</i> “manganese crystals” <i>sera</i> “sulfur” <i>izvest</i> “lime” <i>zelénka</i> “brilliant green” <i>kislota</i> “acid”
Milieu	<i>nebo</i> “sky” <i>zakat</i> “sunset” <i>noč</i> “night” <i>utro</i> “morning”	<i>dymka</i> “mist” <i>voskhod</i> “sunrise”	<i>vesna</i> “spring”
Metals	<i>zoloto</i> “gold” <i>stal</i> “steel” <i>srebro</i> “silver”		<i>bronzâ</i> “bronze”

1. suffixed object name; for example, *moločnyj* “milky”;
2. object name; for example, *fuksiâ* “fuchsia”;
3. compound or modified object name; for example, *mokryj asfal't* “wet asphalt”;
4. compound or modified suffixed object name and color name; for example *cypláčij žéltyj* “chick's yellow”.

Notably, the prevalence of these word-formation patterns is strikingly different from that in English: in Russian, color terms take predominantly an adjectival form of the “parent” object name with added suffixes: *-ov-* (*farforovyj* “porcelain-colored”), *-ev-* (*gruševoj* “pear-colored”), *-n-* (*stal'noj* “steel-colored”), or *-sk-* (*burgundskij*) (pattern

TABLE 5 Man-made object referents in Russian color terms

	In both samples	Only by female	Only by male
Pigments and colorants	<i>okhra</i> “ocher” <i>lazur</i> “azure” <i>ultramarin</i> “ultramarine” <i>kadmij</i> “cadmium” <i>indigo</i> “indigo”	<i>karmin</i> “carmine” <i>viridian</i> “viridian”	<i>gencian</i> “gentian violet” <i>siena</i> “sienna” <i>krap</i> “red pigment from <i>Rubia tinctoria</i> ” (alluding to the color of berets of soldiers in Russian special military units)
Artifacts	<i>terrakota</i> “terracotta” <i>černila</i> “ink” <i>krajola</i> “crayola”	<i>seladon</i> “celadon” <i>farfor</i> “porcelain” <i>flomaster</i> “felt-tip pen” <i>purpurnoe serdce</i> “purple heart”	<i>svetofor</i> “traffic lights” <i>lis'a šerst' v knigax</i> “fox hair in books” <i>poliklinika</i> “polyclinic”
Advertisement	<i>tiffani</i> “tiffany”	<i>tango</i> “tango” <i>frezovyj</i> “color of wild strawberry” <i>kamelopardovyj</i> “color of a giraffe” <i>glamur</i> “glamour”	<i>amerikanskaya lužajka</i> “American lawn” <i>niagara</i> “Niagara” <i>metallik</i> “metallic” <i>murena</i> “blue ribbon eel” <i>verdepeševyj</i> “color of green peach”
Fabrics		<i>barkhat</i> “velvet” <i>kumač</i> “red bunting” <i>velvet</i> “corduroy” <i>džins</i> “jeans”	<i>okhotnik</i> “hunter” <i>voenno-vozdušnyje sily</i> “air force” <i>navi</i> “navy”
Cosmetics	<i>pudra</i> “powder”	<i>pomade</i> “lipstick” <i>teni</i> “eye shadows” <i>grim</i> “makeup” <i>rumâna</i> “rouge”	<i>tonal'nik</i> “foundation” <i>lak</i> “nail polish”
Building materials	<i>kirpič</i> “brick” <i>asfalt</i> “asphalt” <i>beton</i> “concrete”	<i>morėnyj dub</i> “bog oak”	<i>dsp</i> (acronym of: <i>drevesno-stružečnaja plita</i> ) “particleboard”

TABLE 6 Food and beverages referents in Russian color terms

	In both samples	Only by female	Only by male
Sweets	<i>krem</i> “custard” <i>šokolad</i> “chocolate”	<i>zefir</i> “zephyr” <i>žvačka</i> “bubble gum” <i>vanil</i> “vanilla”	<i>karamel</i> “caramel”
Alcohol	<i>bordovyj</i> “claret” <i>vino</i> “wine”	<i>burgundskij</i> “burgundy” <i>burbon</i> “bourbon” <i>šampan</i> “champagne”	
Dairy products	<i>jogurt</i> “yoghurt” <i>moloko</i> “milk”	<i>slivki</i> “cream”	<i>smetana</i> “sour cream”
Spices	<i>gorčica</i> “mustard”	<i>kurkuma</i> “turmeric” <i>šafra</i> n “saffron”	<i>karri</i> “curry”
Hot and soft drinks	<i>kakao</i> “cocoa” <i>kofe</i> “coffee”	<i>burda</i> “slipslop” <i>zelėnyj čaj</i> “green tea”	

[1]). Moreover, Russian speakers use names with multiple compounds and modifiers ([3] and [4])—to convey the perceived colour with high precision.<sup>1</sup> It is also worth noting that, among the offered color terms that lexically are equivalent to object names ([2]), 39 apparently have emerged recently (eg, *navi* “navy”, *čirok* “teal”, *taup* “taupe”, *lajm* “lime”, *karri* “curry”, *zelėnyj čaj* “green tee”, *cikorij* “chicory”, *tykva* “pumpkin”, etc.), since they had not been attested in the catalog of Vasilevich et al.,<sup>34</sup> that is, about just 2 decades ago.

Participants of both genders eagerly used the pattern “color of X”. Women, in particular, used this pattern in 23 different combinations (50 cases), to denote color of fuchsia (*cvet fuksii*), asphalt (*cvet asfal'ta*), ripe cherry (*cvet speloj višni*), among others, along with emotionally-laden, “poetic” terms, alluding, for example, to the color of a murky sky (*cvet pasmurnogo neba*), light blue wave (*cvet goluboj volny*), fresh grass (*cvet svežej travy*), juicy green (*cvet sočnoj zeleni*), so forth. Also men used the pattern “color of X” abundantly, in 25 different combinations (36 cases), denoting color of skin (*cvet koži*), dry grass (*cvet sukhoj travy*), graphite (*cvet grafita*), loam (*cvet suglinka*), mint (*cvet mâty*), sea water (*cvet morskoj vody*), green cabbage (*cvet zelėnoj kapusty*), manganese crystals (*cvet margancovki*), or the brilliant green (*cvet zelėnki*). (The 2 latter substances are widely used by Russians as natural pharmaceutical products.) Significantly less frequent were idiosyncratic or exotic compounds, referring to color of water (*cvet vody*), radish (*cvet rediski*), night sky (*cvet nočnogo neba*), dark conifer forest (*cvet tēmno-khojnogo lesa*), sea salt water (*cvet morskoj*

*solėnoj vody*), Uruguay pampas (*cvet urugvajskix pampasov*), fox hair in books (*cvet lis'ej šersti v knigax*) etc.

### 3.5 | Consistency of object-derived color descriptors

As described in detail elsewhere,<sup>1,2</sup> in the experimental program, one randomly selected color sample was presented to each participant twice, in order to estimate response consistency. In the frequency analysis reported above we excluded responses to repeated color samples. Here, for object-derived color names, we present 2 measures of consistency based on response to those repeated color samples:

1. full consistency, when observer's response was identical in both cases of color sample presentation;
2. hue consistency, when the 2 color names were partly different but both contained a common hue component of the referent object (eg, *sirenevij* “lilac” vs. *tēmno-sirenevij* “dark lilac”).

Not unexpectedly, consistency of object-derived color descriptors was noticeably lower than the response consistency for the whole data set of Russian color names (Figure 9).<sup>1</sup> Men appeared to excel women with regards to full name consistency (Figure 6, left), at odds with previous studies for English speakers,<sup>44-47</sup> but the difference was not significant ( $\chi^2 = 2.38$ ,  $P = .12$ , using Yate's correction). Women, in comparison, although having offered for repeated color samples term variations, more frequently than men used in both responses the same object name, thus, being slightly more consistent in hue-

TABLE 7 Fauna referents in Russian color terms

	In both samples	Only by female	Only by male
Birds		<i>aičnaâ skorlupa</i> “egg shell” <i>cyplėnok</i> “chicken” <i>golub</i> “dove” <i>kanarejka</i> “canary” <i>čirok</i> “teal”	
Mammals		<i>myš</i> “mouse” <i>taup</i> “taupe” <i>tigr</i> “tiger” <i>verblūd</i> “camel”	
Fish	<i>losos</i> “salmon”		

TABLE 8 Body and bodily products as referents in Russian color terms

	In both samples	Only by female	Only by male
Body and bodily products	<i>telo</i> “flesh” <i>krov</i> “blood” <i>detskaâ neožidannost’</i> (lit.: “a child’s surprise”; euphemism for) “baby’s poo”		<i>koža</i> “skin” <i>ponos</i> “diarrhea” <i>kakaha</i> “piece of shit” <i>blevota</i> “puke” <i>govno</i> “turd” <i>der’mo</i> “shit”

consistency measure (Figure 6, right) but again the difference was not significant ( $\chi^2 = 0.04$ ,  $P = .84$ , using Yate’s correction).

We further analyzed instances when an observer used 2 noncognate names for the repeated color sample to ascertain common synonyms. For the most frequent object-derived color terms, we found the following synonymic rows:

**sirenevij “lilac”:** *fioletovij* “purple”, *rozovij* “pink”, *fioletovo-rozovij* “purple-pink”, *sinij* “blue”, *goluboj* “light blue”, *sero-goluboj* “gray-light blue”, *fialkovij* “violet-colored”, *orhideâ* “orchid”;

**birûzovij “turquoise”:** *zelënyj* “green”, *sinij* “blue”, *goluboj* “light blue”, *sero-zelënyj* “gray-green”, *lazorevij* “azure”, *nebesnyj* “sky-colored”, *morskoj volny* “sea wave”, *zelënoe âbloko* “green apple”;

**salatovij “lettuce”:** *zelënyj* “green”, *žëltyj* “yellow”, *žëlto-zelënyj* “yellow-green”, *golubo-zelënyj* “light blue-green”, *ultramarine* “ultramarine”;

**bordovij “claret”:** *fioletovij* “purple”, *koričnevij* “brown”, *krasno-koričnevij* “red-brown”, *tëmno-koričnevij* “dark brown”, *buryj* “dust brown”, *grâzno-krasnyj* “dirty red”, *alyj* “scarlet”, *fuksiâ* “fuchsia”;

**malinovij “raspberry”:** *rozovij* “pink”, *krasnyj* “red”, *fioletovij* “purple”, *purpurnyj* “cardinal red”, *lilovij* “mauve”, *alyj* “scarlet”;

**bolotnyj “marsh-colored”:** *koričnevij* “brown”, *koričnevo-zelënyj* “brown-green”, *tëmno-zelënyj* “dark green”, *grâzno-zelënyj* “dirty green”, *tëmno-zelëno-sinij* “dark green-blue”, *olivkovij* “olive”, *travânoj* “grass-colored”;

**persikovij “peach”:** *rozovij* “pink”, *oranževij* “orange”, *tusklo-oranževij* “dull orange”, *pastelno-oranževij* “pastel orange”, *mandarinovij* “tangerine”;

**korallovij “coral”:** *krasnyj* “red”, *morkovnyj* “carrot”, *tëmno-grâzno-rozovij* “dark dirty pink”;

**fuksiâ “fuchsia”:** *rozovij* “pink”, *fioletovij* “purple”, *purpurnyj* “cardinal red”, *bordovij* “claret”, *malinovij* “raspberry”;

**gorčičnyj “mustard-colored”:** *zelënyj* “green”, *žëltyj* “yellow”, *okhra* “ocher”, *pesčanyj* “sand-colored”, *lajm* “lime”.

### 3.6 | Culture-specific features of object-derived color names in Russian

To assess culture-specific features of object-derived color names in Russian, the outcome of our analysis was compared to that for English, which belongs to the same Indo-European group of languages. Crucially, English corpus of color names was obtained in the experiment with the same design,<sup>39</sup> hence, we treated both datasets as comparable.

We found that in both languages the number of objects used as color-term referents constitute a significant number: 215 objects (15%) among 1422 Russian unique color words, compared to 251 objects (20%) among 1226 English unique color words (Table 9).

Although the number of object referents is only slightly greater in English than in Russian, the inventories vary substantially between the two. Notably, 101 referents offered by Russian respondents and 137 by English were “endemic” to each of the 2 languages, with differences being particularly prominent in the “Man-made objects” and “Flora” classes (Figure 7).

The lists of the objects overlapped only partly between English and Russian. As demonstrated by Table 10, the most significant differences were found in the class of man-made objects. Results enabled ascertaining referent lacunae in Russian color inventory, specifically in the categories of

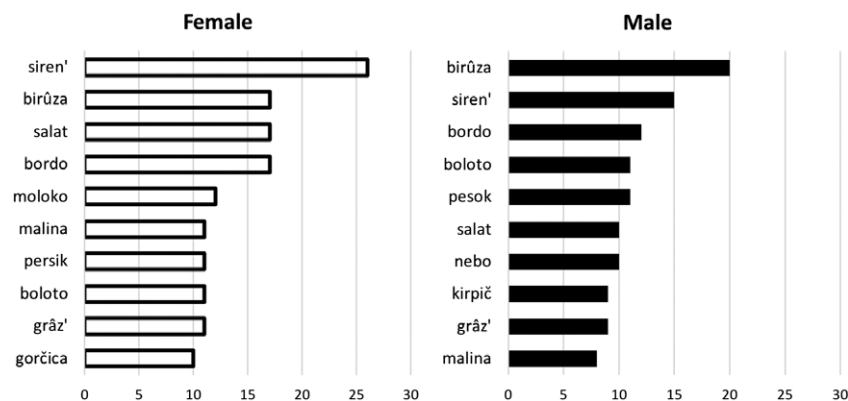
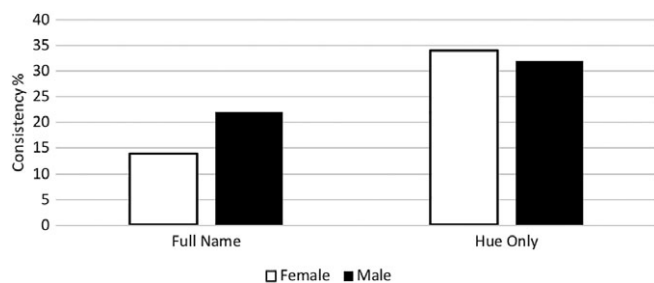


FIGURE 5 Color-term object referents with the greatest derivational productivity, for females (left) and males (right)





**FIGURE 6** Consistency of object-derived color-term responses to repeated color samples for females and males

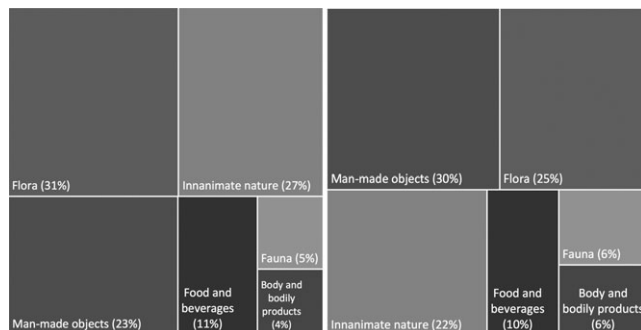
advertisement, certain artifacts, dyes and pigments, fabrics, whose referents, until recent times, were inexistent or poorly lexicalized. Further, we identified a very recently emerged category of color terms, that are recorded solely in advertisement and emerged as transliteration of English loanwords to fill in the gap of lexicalization of colors on demand. This

phenomenon—of potentiating the “luring” marketing message by alluding to color of prestigious and socially desired objects—resonates with that identified in US advertising, that is, of signifying color of premium brands by highly elaborated, idiosyncratic or exotic color terms.<sup>48</sup>

Interestingly, the category “Advertisement” was found to include 3 archaic Russian words: *frezovyy* “color of wild strawberry”, *kamelopardovyy* “color of giraffe”, and *verde-peševyy* “color of green peach” (all of French origin), that are no longer in everyday use. These terms—which were part of the Russian aristocracy’s parlance still by the beginning of the 20th century—are now eagerly used in the marketing lexicon, apparently, to impart an old-fashioned, noble flavor to premium brands of textiles, clothes, makeup or house paints and interiors. Finally, color names *metallik* “metallic” and *murena* (a dark shade of teal, alluding to blue and green colors of blue ribbon eel) were recorded only in Russian

**TABLE 9** Categories of objects referred to in the Russian (RU)<sup>1</sup> and English (EN)<sup>39</sup> corpora of color names

Class	Category	RU	EN	Correspondence
Flora	Fruits	12	11	8
	Vegetables	9	7	3
	Berries	8	7	6
	Nuts	3	4	2
	Plants	19	15	11
	Flowers	16	20	7
	<b>Flora</b>		<b>67</b>	<b>64</b>
Fauna	Fish	1	1	1
	Birds	5	6	4
	Mammals	4	9	3
<b>Fauna</b>		<b>10</b>	<b>16</b>	<b>8</b>
Inanimate nature	Natural objects and substances	23	24	12
	Milieu	7	14	5
	(Semi-) precious stones	13	8	6
	Metals	4	3	3
	Chemical elements and compounds	10	7	4
	<b>Inanimate nature</b>		<b>57</b>	<b>56</b>
Food and beverages	Sweets	6	13	5
	Spices	4	3	2
	Dairy products	4	3	3
	Alcohol	5	4	3
	Hot and soft drinks	4	2	1
	<b>Food and beverages</b>		<b>23</b>	<b>25</b>
Man-made objects	Dyes and pigments	10	25	8
	Building materials	5	3	1
	Artefacts	10	17	4
	Fabrics	7	23	2
	Cosmetics	7	3	2
	Advertisement	10	4	0
	<b>Man-made objects</b>		<b>49</b>	<b>75</b>
<b>Body and bodily products</b>		<b>9</b>	<b>15</b>	<b>8</b>
<b>Total</b>		<b>215</b>	<b>251</b>	<b>114</b>



**FIGURE 7** Percentage of occurrence of categories of object-derived color terms in the Russian<sup>1</sup> (left) and English<sup>39</sup> (right) corpora

males' inventory. Both terms are limited though to advertised car paints in automotive industry and prompt Bergh's<sup>49</sup> argument that the car industry often seems to prefer connotation to denotation as its main color naming strategy.

Also, referent inventories of the “Flowers”, “Vegetables”, “Natural Objects and Substances”, “Milieu”, “Food and Beverages” categories considerably differ between the 2 languages.

In particular, in their color terms Russian participants frequently referred to *salat* “lettuce”, *morkov* “carrot”, *svěkla* “beetroot”, *kapusta* “cabbage”, *redis* “radish”, that is, vegetables traditionally grown in Russia in backyards, that are accessible, inexpensive and form the basis of authentic Russian cuisine.<sup>50</sup> To denote color, respondents also used derivatives of *smetana* “sour cream”, dairy product that is widely applied in cooking in Russia.

Conversely, English respondents offered many more names derived from sweets (candy floss, toffee, sugar, biscuit, sherbet, and honey). These color terms designate the color space area between pink, orange, red and yellow, that is, the one of hard-to-name in English (eg, Ref. 51). In comparison, the only Russian referent in the sweets category included *zefir*, a fruit confectionery traditionally coloured white, pink or white-pink and, for its airiness, named after Zephyrus, the Greek god of the airy west wind.<sup>52</sup>

### 3.7 | Color space areas denoted by object-derived color terms

The predominant number of the elicited object-derived color terms appeared to designate various shades in the BLUE, PURPLE, and YELLOW-GREEN areas of color space.

#### 3.7.1 | Object-derived “Russian blues”

We identified for color terms denoting the blue area of color space 35 different object referents, half of which (17 objects) were “endemic” to Russian and not found in the English dataset (Table 11). The elicited object-derived “Russian blues” had varying meaning proximity to BCTs *sinij* “blue” and *goluboj* “light blue” (Figure 8). The greatest proximity to *sinij* “blue” was revealed for the words referred to *noč* “night”, *indigo* “indigo”, *brilliant* “diamond”, *navi* “navy”, and *džins* “jeans”. In comparison, the centroid of *goluboj*

“light blue” was very similar to those for color terms derived from *nebo* “sky”, *lazur* “azure”, and *more* “sea”. Noteworthy, many of the same non-basic terms were among those elicited by Frumkina<sup>25</sup> as clusters names in a free-sorting task of Munsell chips (see Figure 9) and, also, in unconstrained color-naming of NCS samples by Safuanova and Korzh (Table 2).<sup>53</sup>

#### 3.7.2 | Object-derived terms in the PURPLE category

Russian speakers offered 27 different object-derived PURPLE-category terms, 14 of them were “endemic” (Table 12). Note that some of the non-basic purple terms are among the most frequent in Russian, such as *malinovyj* “raspberry”, *bordovyj* “claret”, *višněvyj* “cherry-colored”, *fuksiâ* “fuchsia” and other. Along with BCT *fioletovyj* “purple”, that is, compared to English *purple*, is constrained to violet shades in its denotata (Figure 10), these terms are complements necessitated by Russian speakers to name the whole PURPLE area (Figure 8 and Table 4).<sup>1,55</sup>

#### 3.7.3 | Object-derived color names in YELLOW-GREEN area of color space

The most prominent color names elicited in the YELLOW-GREEN area of color space were related to food and edible substances:

**fruits:** *olivka* “olive”, *lajm* “lime”, *limon* “lemon”, *âbloko* “apple”, *gruša* “pear”, *banan* “banana”, *persik* “peach”, *abrikos* “apricot”;

**herbs:** *mâta* “mint”, *zelen* “potherbs”, *lipa* “linden”, *raps* “rapeseed”, *tabak* “tobacco”;

**vegetables:** *salat* “lettuce”, *kapusta* “cabbage”;

**nuts:** *fistaška* “pistachio”, *orekh* “nut”;

**cereals:** *pšenica* “wheat”;

**spices:** *gorčica* “mustard”, *šafiran* “saffron”, *kurkuma* “turmeric”, *karri* “curry”;

**sweets:** *karamel* “caramel”, *vanil* “vanilla”, *krem* “custard”;

**beverages:** *šampan* “champagne”, *zelěnyj čaj* “green tea”.

To visualize denotata of the most prominent Russian “edible” color names, we trained a color-naming model based on maximum a posteriori program—which favors more frequent color names over less common and inconsistent ones solely by color names related to the indicated object names (cf. Ref. 10). Figure 11 presents an outcome in projection on the Munsell array, that is, the surface of most saturated colours. It is apparent that among the 12 most frequent “edible” terms, *salatovyj* “lettuce” and *olivkovyj* “olive” denote the largest areas.

### 3.8 | Comparison of centroids for Russian and English object-derived color terms

We compared location of centroids for the corresponding object-derived Russian and English color names in each of the 6 classes that were identified: Flora, Fauna, Inanimate Nature, Food and Beverages, Man-Made Objects, Body, and

TABLE 10 The inventory of frequent referent objects

Class	Category	In both languages	Only in Russian	Only in English
Flora	Plants	Algae <sup>#</sup> , coniferous forest, foliage <sup>#</sup> , grass, mint, moss, pine, potherbs <sup>#</sup> , spruce <sup>#</sup> , wheat <sup>#</sup> , wood	Angelica*, fern*, heather*, linden*, slime*, straw, tobacco*	Lemongrass <sup>#</sup> , oat <sup>#</sup> , sage, vine <sup>#</sup>
	Flowers	Cornflower, fuchsia, lavender, lilac, orchid <sup>#</sup> , rose, violet	Campanula, chicory*, crocus*, forget-me-not*, heliotrope, petunia*, phlox*, rapeseed*, thistle*	Buttercup <sup>#</sup> , carnation, geranium <sup>#</sup> , hyacinth, iris, marigold <sup>#</sup> , mauve, periwinkle, petal <sup>#</sup> , primrose, sunflower, tulip <sup>#</sup>
	Fruits	Apple, apricot, lime, lemon, olive, peach, plum, tangerine*	Banana, orange, pear, pomegranate	Citrus, damson <sup>#</sup> , melon
	Vegetables	Eggplant, pumpkin*, tomato*	Asparagus, beetroot, cabbage*, carrot, lettuce, radish*	Corn <sup>#</sup> , maize <sup>#</sup> , pea, spinach <sup>#</sup>
	Berries	Berry*, blackberry, cherry, grape*, raspberry <sup>#</sup> , strawberry <sup>#</sup>	Blueberry, cowberry	Goji berry <sup>#</sup>
	Nuts	Pistachio	Nut	Chestnut
Inanimate nature	Natural objects and substances	Aqua, clay, earth, graphite <sup>#</sup> , ice*, sand, sea, snow <sup>#</sup> , sun <sup>#</sup> , swamp <sup>#</sup> , water, mud, dirty	Desert*, foam*, lagoon, lead*, pampas*, plain*, sea wave, shungite*, ultraviolet, waterfall*, moon	Anthracite <sup>#</sup> , charcoal, pebble <sup>#</sup> , slime <sup>#</sup> , stone, chalk <sup>#</sup> , cloud <sup>#</sup> , dust, ocean, river <sup>#</sup> , slate, taint <sup>#</sup>
	(Semi-) precious stones	Aquamarine, coral, emerald, jade*, pearl <sup>#</sup> , turquoise	Amethyst, brilliant, ivory, malachite, marble*, nacre, ruby	Amber <sup>#</sup> , porphyry <sup>#</sup>
	Chemical elements and compounds	Acid*, cobalt*, neon, rust	Arsenic*, brilliant green*, lime*, manganese crystals, menthol*, sulfur	Carbon <sup>#</sup> , chrome <sup>#</sup> , petrol
	Milieu	Mist <sup>#</sup> , night <sup>#</sup> , sky, spring <sup>#</sup> , sunset	Morning*, sunrise*	Autumn <sup>#</sup> , dusk, marine, murk, skylight <sup>#</sup> , stormy <sup>#</sup> , summer, sunshine <sup>#</sup> , tropic <sup>#</sup>
	Metals	Gold, silver, steel <sup>#</sup>	Bronze	
Man-made objects	Dyes and pigments	Azure, cadmium, carmine, indigo, ocher, sienna*, ultramarine, viridian*	Gentian violet*, red (of dyer's madder)*	Burnt orange, CMYK purple <sup>#</sup> , English red <sup>#</sup> , Hansa yellow, Klein blue, madder, Mars black <sup>#</sup> , Naples yellow <sup>#</sup> , process purple, Prussian green <sup>#</sup> , Saxe blue <sup>#</sup> , umber, venetian red <sup>#</sup> , Grecian white <sup>#</sup> , Prussian blue, sepia, veraman
	Artifacts	Celadon*, hospital*, ink <sup>#</sup> , terracotta	Crayola, felt-tip pen, fox hair in books*, porcelain*, purple heart*, traffic lights*	Aquarian green, bathroom, bottle green, display green <sup>#</sup> , garbage light <sup>#</sup> , groovy chick bed linen <sup>#</sup> , gun metal blue <sup>#</sup> , light violin <sup>#</sup> , recycled paper <sup>#</sup> , school bus yellow, windows blue
	Advertisement		American lawn*, color of giraffe*, color of green peach*, color of wild strawberry*, glamour, metallic*, blue ribbon eel*, Niagara*, tango*, tiffany	Arctic blue <sup>#</sup> , baby blue, eau de nil, hot mama <sup>#</sup>
	Fabrics	Hunter <sup>#</sup> , navy*	Air force*, corduroy*, jeans, red bunting*, velvet*	Army green, Barbie pink <sup>#</sup> , blue RAF (Royal air Force), cadet blue,

(Continues)

TABLE 10 (Continued)

Class	Category	In both languages	Only in Russian	Only in English
				Camelot pink <sup>#</sup> , camouflage <sup>#</sup> , cardinal red <sup>#</sup> , Chelsea blue <sup>#</sup> , chiffon <sup>#</sup> , dodger blue <sup>#</sup> , doll pink <sup>#</sup> , drab, ecru, imperial <sup>#</sup> , military green, old leather <sup>#</sup> , racing green <sup>#</sup> , royal, russet <sup>#</sup> , safety yellow <sup>#</sup>
	Cosmetics	Lipstick <sup>*#</sup> , powder	Eye shadow <sup>*</sup> , foundation <sup>*</sup> , makeup <sup>*</sup> , nail polish <sup>*</sup> , rouge <sup>*</sup>	Toothpaste <sup>#</sup>
	Building materials	Brick	Asphalt, bog oak <sup>*</sup> , concrete, particleboard <sup>*</sup>	Cement <sup>#</sup> , glass <sup>#</sup>
Food and beverage	Sweets	Bubble gum <sup>*</sup> , caramel <sup>*#</sup> , chocolate, custard <sup>#</sup> , vanilla <sup>*</sup>	Zephyr	Biscuit, bisque <sup>#</sup> , candy floss, dough <sup>#</sup> , honey <sup>#</sup> , sherbet, sugar, toffee
	Alcohol	Bordeaux, burgundy <sup>*</sup> , claret, wine	Bourbon <sup>*</sup> , champagne <sup>*</sup>	Chartreuse
	Dairy products	Cream <sup>*</sup> , milk <sup>#</sup> , yoghurt <sup>#</sup>	Sour cream <sup>*</sup>	
	Spices	Mustard, saffron	Curry <sup>*</sup> , turmeric <sup>*</sup>	Chili pepper <sup>#</sup>
	Hot and soft drinks	Green tea <sup>*#</sup>	Cocoa, coffee, slingslop <sup>*</sup>	Juice <sup>#</sup>
Fauna	Birds	Canary <sup>*#</sup> , dove <sup>*</sup> , egg shell <sup>*</sup> , teal <sup>*</sup>	Chicken	Peacock <sup>#</sup> , petrel <sup>#</sup>
	Mammals	Camel <sup>*#</sup> , mouse <sup>*#</sup> , taupe <sup>*</sup>	Tiger <sup>*</sup>	Buff, fawn, fox, fur <sup>#</sup> , pig, pony <sup>#</sup>
	Fish	Salmon		
Body and bodily products	Blood, diarrhea <sup>#</sup> , flesh, piece of shit, poo <sup>*#</sup> , puke <sup>#</sup> , shit <sup>*</sup> , skin	baby's poo	Blush, fascia <sup>#</sup> , human <sup>#</sup> , liver <sup>#</sup> , nude <sup>#</sup> , stomach <sup>#</sup> , tan	

Comparison between English and Russian; (\*) cases offered by only one Russian native speaker; (#) cases offered by only one English native speaker.

Bodily Products. Centroids for each color category were calculated by averaging CIELAB co-ordinates of all color samples under the same name; these were obtained for the whole participant sample and compared with English data obtained in our previous study.<sup>39</sup> The data are visualized in Figures 12–17, in projection on the CIELAB chromatic plane  $a^*b^*$ . The color of each marker is the sRGB centroid of the distribution of samples generating that object-related color name response. Corresponding pairs in Russian and English are connected with black lines.

Noteworthy are discrepancies for certain color terms derived from object names in different classes and categories, which may originate from different sources.

1. A bluish *âbloko* “apple”, in comparison to English (Figure 12 and Supporting Information, Table S1) in Russian may be explained by the fact that there was only a single response, so we are not confident about the location of its single-point-centroid.
2. Large distance between the centroids for Russian and English color terms derived from the object name *kislota* “acid” (Figure 14 and Supporting Information,

Table S3) is hardly of surprise since this category covers the greatest area in color space, as shown in previous studies for Russian.<sup>56</sup>

3. Discrepancies between the centroids of color terms referred to *moloko* “milk” (Figure 15 and Supporting Information, Table S4) might be because this object name is often used as a modifier (cf. English “milky blue” with Russian *kofe s molokom* “coffee with milk”, *moločno-oranževyj* “milky orange”, *moločno-rozovyj* “milky pink”, *moločno-žěltyj* “milky yellow”, *moločno-salatovyj* “milky lettuce-colored”).
4. Weak correspondence between Russian and English color terms derived from the object name *poliklinika* “polyclinic” (Figure 16 and Supporting Information, Table S5) reflects the culture-specific context of health-care design.

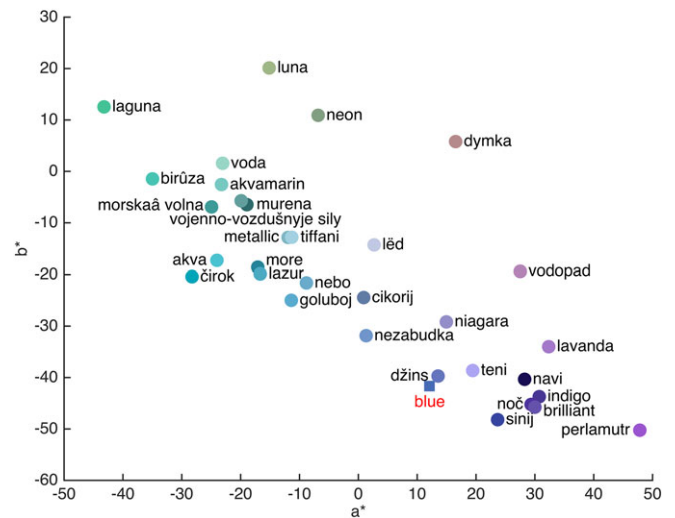
## 4 | CONCLUSIONS

1. In accord with previous studies,<sup>8,22,34,57,58</sup> we demonstrated that the nomenclature of classes and categories of

**TABLE 11** Object-derived “Russian blues”; “endemic” terms are marked gray

Object name		Number of derivates	
In Russian	In English	F	M
Birûza	Turquoise	17	20
Morskââ volna	Sea wave	9	4
Lazur'	Azure	7	8
Nebo	Sky	6	10
Neon	Neon	6	1
Vasilëk	Cornflower	4	1
More	Sea	4	6
Lavanda	Lavender	2	2
Akvamarin	Aquamarine	2	5
Džins	Jeans	2	0
Kolokol'čik	Campanula	1	0
Cikorij	Chicory	1	0
Nezabudka	Forget-me-not	1	0
Laguna	Lagoon	1	2
Luna	Moon	1	1
Dymka	Mist	1	0
Perlamutr	Nacre	1	1
Tiffani	Tiffany	1	1
Teni	Eye shadows	1	0
Noč	Night	1	3
Akva	Aqua	1	1
Ultramarin	Ultramarine	1	3
Indigo	Indigo	1	2
Kobal't	Cobalt	1	0
Golub'	Dove	1	0
Čirok	Teal	1	0
Voda	Water	0	3
Lëd	Ice	0	1
Navi	Navy	0	1
Vodopad	Waterfall	0	1
Brilliant	Diamond	0	1
Vojenno-vozdusnyje sily	Air force	0	1
Niagara	Niagara	0	1
Metallik	Metallic	0	1
Murena	Blue ribbon eel	0	1

objects that serve as color-term referents in the modern Russian language has quite well-defined scope. The referential frame is set by the principle of using prototypical objects with specific, easily recognizable color, which are widely spread in everyday environment and are well known to Russian language speakers. Fundamental elements of reference in the description of perceived color include natural-environment objects (elements of landscape, natural materials, plants, and flowers), traditional food (fruit, vegetables, and berries), which in modern research coined by umbrella terms “climate of color”,<sup>59</sup> “geography of color”,<sup>60</sup> “geology of color”,<sup>61</sup> “color motherland” (*Farbheimat*),<sup>62</sup> or “color language”.<sup>63</sup>

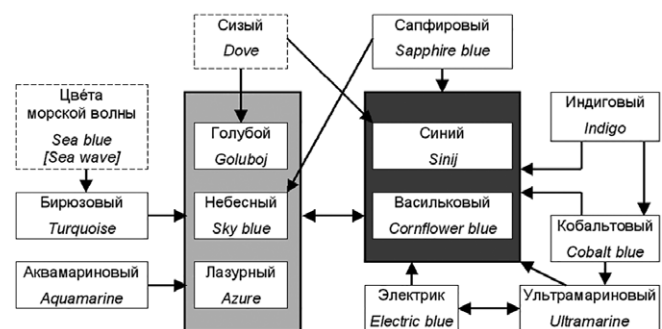


**FIGURE 8** Location of centroids for the object-derived “Russian blues” (filled circles) compared with a centroid for the English term *blue* (filled square);  $a^*b^*$  plane in CIELAB

- As expected, females revealed a richer object-derived color vocabulary, reflected by the number of unique color descriptors, the finding in accord with that for English.<sup>46</sup> Males, in comparison, offered more idiosyncratic or exotic compounds.

Analysis of the inventories of different categories of Russian object-derived non-BCTs demonstrates that some of these categories are exclusively female or male. While describing color, Russian female respondents much more often use such referents as berries, flowers, names of animals and birds, names of precious and semiprecious stones, food and beverages, textiles, the tendency also reported for some Caucasian cultures.<sup>64</sup> In comparison, the vocabulary of Russian men contains more color names referring to plants, vegetables, natural objects and natural substances, chemical elements and their compounds, artifacts, body, and bodily products.

- Predominant number of object-derived color names were reported to be inexact concepts.<sup>65–67</sup> In our dataset we



**FIGURE 9** Structure of Russian object-derived blue color terms clustered around BCTs *sinij* and *goluboj* (obtained by naming groups in a free-sorting task). Sources: Ref. 25, p. 59; 54, p. 16

**TABLE 12** Object-derived terms in the purple category; “endemic” terms are marked gray

Object name		Number of derivates	
In Russian	In English	F	M
Siren'	Lilac	26	15
Bordovyj	Claret	17	12
Malina	Raspberry	11	8
Baklažan	Eggplant	9	8
Fuksiâ	Fuchsia	7	2
Višnâ	Cherry, cerise	6	6
Fialka	Violet	5	1
Sliva	Plum	4	2
Brusnika	Cowberry	4	0
Černika	Blueberry	2	0
Čemila	(Violet) ink	2	0
Vino	Wine	2	4
Eževika	Blackberry	1	0
Âgoda	Berry	1	0
Burgundskij	Burgundy	1	0
Geliotrop	Heliotrope	1	1
Čertopolox	Thistle	1	0
Floks	Phlox	1	0
Krokus	Crocus	1	0
Petunija	Petunia	1	0
Ultrafiolet	Ultraviolet	1	1
Ametist	Amethyst	1	1
Purpurnoe serdce	Purple heart	1	0
Granat	Pomegranate	1	1
Svëkla	Beetroot	1	2
Margancovka	Manganese crystals	0	2
Gencian	Gentian violet	0	1

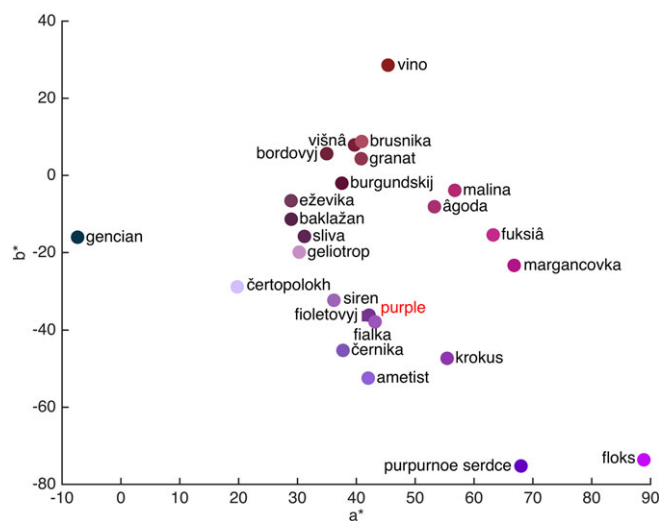
found the greatest variability of color meanings among color names derived from the objects belonging to the categories “Natural objects and substances” and “Milieu”. It is of no surprise, though, since color names composing these categories refer to entities with a wide range of color gradations (cf. *zakat* “sunset”, *dymka* “mist” or *more* “sea”). The finding hints at unstable prototypes, and probably big periphery and fuzzy boundaries of these 2 categories; however, to estimate how compact (or loose) the structure of the categories is would require obtaining judgments on the color's degree of typicality or graded membership (cf. Ref. 68).

Some other Russian object-derived terms are not only instable, but may denote very different color by different respondents, although referring to the same object. A glaring example is the color meaning of *cikorij* “chicory”, greatly disputable among Russian speakers: while some imply light blue, color of chicory flower (Figure 8), the other, who have not had an experience of seeing flowers of this plant (which is spread only in some Russian regions), are confident that the term means brown, the color of the chicory drink

(surrogate of coffee, that was mainly consumed in Russia in the post-WWII period of shortages). Another such example is the term *geliotrop* “heliotrope-colored” (cf. Fr. *heliotrope*), which some use to denote a blossoming bush referring to blue and gray-lilac, while other imply the color of a precious stone of green with red spots (cf. Ref. 25, p. 31; Ref. 34, p. 174). Noteworthy, in English, there is a similar case of meaning ambiguity in *hyacinth*, the term that may imply color of either a referent flower or a stone.<sup>69</sup>

- The word-building system of the Russian language makes possible the existence of object-derived color name in at least 3 forms, which are complete synonyms semantically and may be used interchangeably depending only on the individual choice of the speaker.<sup>22,25,31–35</sup> First, color name can be built according to the model “color of X” (eg, *cveta mokrogo asfal'ta* “color of wet asphalt”). As indicated above, this formation pattern is generic across languages and typical for objects that are relatively new as referents in the color inventory in the language in question.

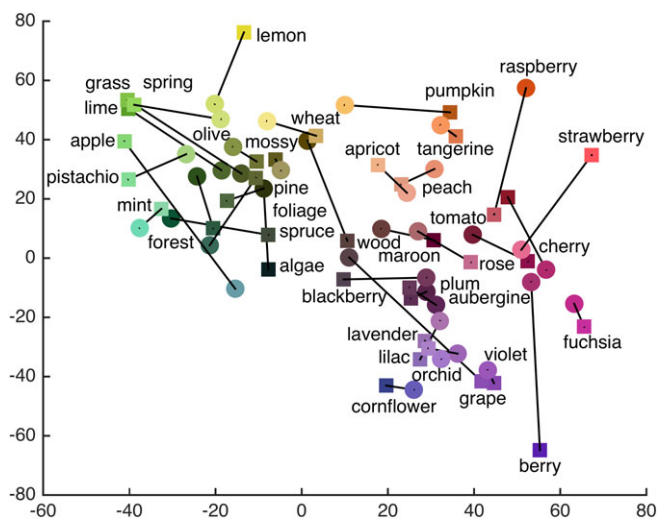
In Russian, the majority of object-derived color terms have the adjectival form, derived from the object “parent” noun using different suffixes (eg, *baklažan* “eggplant” → *baklažannyj*, *baklažanovyj*). In Russian, the adjectival form also accommodates most the novel object loanwords (eg, *glamurnyj* “glamor”, *fistaškovyj* “pistachio”). The existence of adjectival form demonstrates a well-developed system of object-based color names in the language. The adjectival form is characteristic of color names that have been used so long and so frequently that their etymology is not realized by native speakers. (eg, hardly anyone overtly associates raspberry color with the color of actual berries or vinous with the color of wine.)

**FIGURE 10** Location of centroids for the Russian object-derived terms in the purple category (filled circles) compared with a centroid for the English term *purple* (filled square);  $a^*b^*$  plane in CIELAB



**FIGURE 11** Denotata of 12 Russian most frequent “edible” colour names mapped onto the Munsell array (Mercator projection): ■ *olivkovyj* “olive”, ■ *salatovyj* “lettuce”, ■ *mätnyj* “mint”, ■ *limonnyj* “lemon”, ■ *lajm* “lime”, ■ *kremovyj* “custard”, ■ *persikovyj* “peach”, ■ *morkovnyj* “carrot”, ■ *malinovyj* “raspberry”, ■ *bordovyj* “claret”, ■ *baklažanovyj* “eggplant”, and ■ *slivovyj* “plum”. An area paint mimics colour of sRGB centroid of the samples that elicited the colour name in question

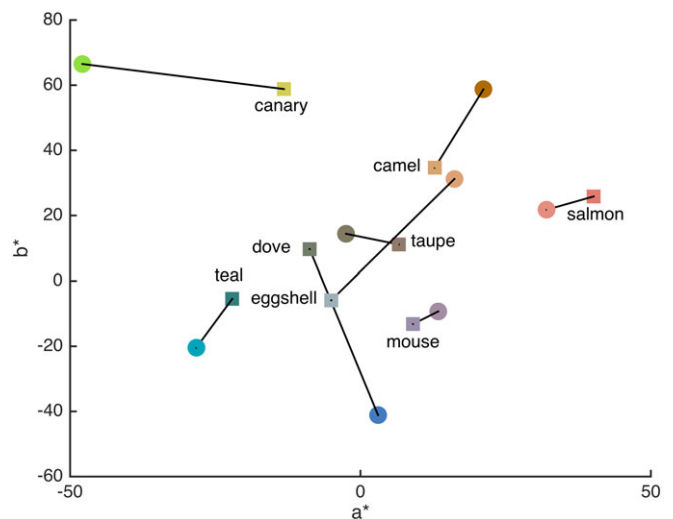
- Specific for modern Russian are recent developments in word formation of object-derived color terms—by using the object “parent” noun, instead of traditional Russian-language adjectival forms, to name the referred to color (eg, *vanil* “vanilla”, *šokolad* “chocolate”), the novel linguistic phenomenon, which, apparently, results from trading globalization and has emerged under the influence of the word-formation pattern in English (modern lingua franca). We observe that such terms are rather infrequent, though, implicate “non-native” referents transliterating terms English loanwords (eg, *akva* “aqua”, *navi* “navy”, *tiffani* “tiffany”, *taup* “taupe”) and are used solely in the “marketing” discourse in relation to premium brands, influenced by “onomasiological competition” between lexical forms in the individual product categories (cf. Ref. 70).
- The choice of object prototypes in the naïve picture of the world is motivated. The prototypes not only help to name precisely the shade of color but also are used to highlight its specific characteristic (matte, shine, depth, saturation etc.) which cannot be expressed with the help of “simple” color terms. Russian language is particularly



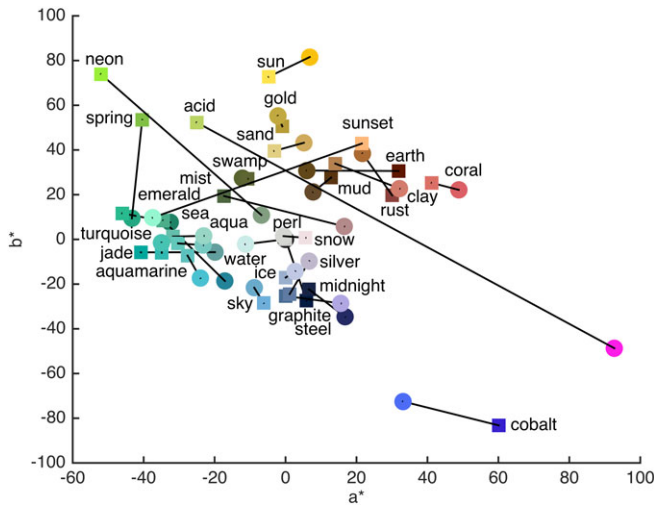
**FIGURE 12** Location of centroids for the corresponding Russian (filled circles) and English (filled squares) object-derived color names in the class “Flora”

elaborated with regard to such linguistic refinement (cf. *čěrnij* “black”—*čěrnij kak smola* “black as tar”; *čěrnij kak voronoe krylo* “black as the raven wing”; *čěrnij kak čěrnila* “black as ink”). In the culture-specific context, the important consequence of using prototypical objects is the addition of evaluative connotation to color names. These objects form axiological character of color naming in ethno-linguistic space.<sup>22–24,58</sup> The image of the object embedded in the color term instigates in the native speaker a multitude of affective associations that are culture-specific.<sup>48</sup> Nevertheless, the alleged color often appears to be far from what is normally conceived of an object (cf. Refs. 11,14; see, for instance, the visualized denotata of *perlamutr* “nacre”, *brilliant* “diamond” in Figure 8, *korall* “coral” in Figure 14 or *vanil* “vanilla” Figure 15).

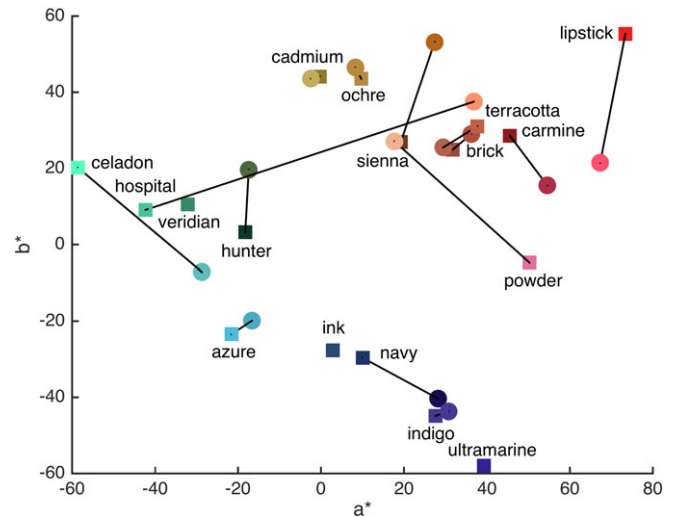
- Finally, in modern Russian we observe that color names derived from the names of prototypical objects undergo functional changes, with extension of their signification. Specifically, while traditionally the main function of object-derived color names was (and is) to designate various shades of color (the function of communication



**FIGURE 13** Location of centroids for the corresponding Russian (filled circles) and English (filled squares) object-derived color names in the class “Fauna”



**FIGURE 14** Location of centroids for the corresponding Russian (filled circles) and English (filled squares) object-derived color names in the class “Inanimate Nature”



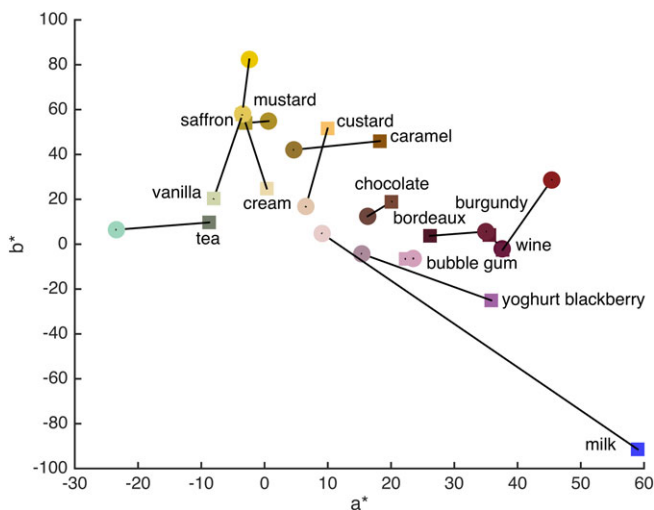
**FIGURE 16** Location of centroids for the corresponding Russian (filled circles) and English (filled squares) object-derived color names in the class “Man-Made Objects”

precision), at present the evocative function<sup>12</sup> is becoming increasingly dominant (eg, Refs. 71,72). It implies using a color term not so much to denote the color of an object but to attract attention to the object (for it to be purchased). Additional factors such as the transfer of connotations and emotions are often important as well (eg, Refs. 12,14,15). In the advertising discourse, this effect is achieved by accompanying the name of a well-known object with an “expressive attribute”, frequently an idiosyncratic one (eg, *isčezaiščij zakat* “disappearing sunset”, *more na zakate* “sea at dusk”, *asfal’t na zakate* “asphalt at dusk”). The stylistic device of “reanimation” of dated Russian object prototypes is used as part of this naming strategy (cf. *frezovyy* “color of wild strawberry”). In both cases, the type of metonymic color expression is shifting from the “logical”, built on the evident color connection between the entity in the metonym and the

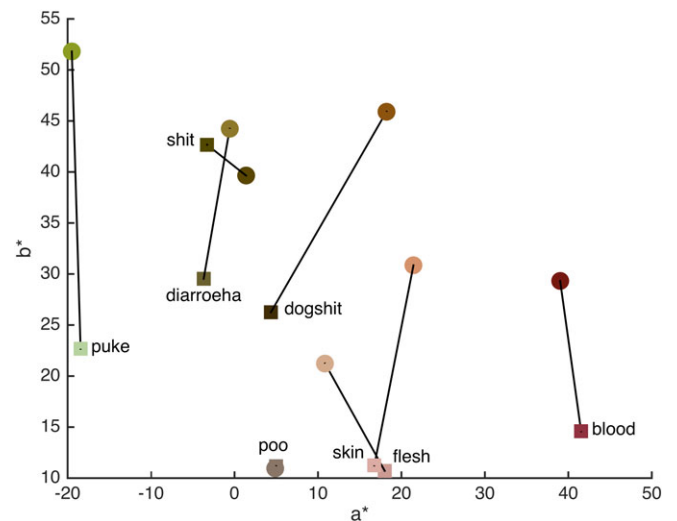
product (cf. *lavender* or *terracotta*) to the “imaginative”,<sup>12,20</sup> where the added non-color element should evoke pleasant feelings, memories and emotions in the potential shoppers, motivating them to buy the product.

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**FIGURE 15** Location of centroids for the corresponding Russian (filled circles) and English (filled squares) object-derived color names in the class “Food and Beverages”



**FIGURE 17** Location of centroids for the corresponding Russian (filled circles) and English (filled squares) object-derived color names in the class “Body and Bodily Products”



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## SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

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