Seeing through dictionaries:
On defining basic colour terms in English, Japanese and Polish lexicography

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It seems that despite the undeniable fact that colour research has received considerable attention for centuries[1] resulting in more than 3000 publications during the last 150 years (MacLaury 1997 after Steinvall 2002), there still exists a niche to be filled. There has been no or very little research regarding colour terms conducted from the viewpoint of (meta)lexicography[2]. The present study is meant to evaluate existing dictionary definitions of Basic Colour Terms[3] (henceforth BCTs) from the colour lexicon of English, Japanese and Polish in order to detect any doubtful content which could be improved to equip the dictionary user with richer, more adequate information regarding the colour lexicon. The immediate aims of the study are to determine: 1) what definition types are used to define CTs 2) what prototypes extensional definitions point to when defining BCTs and how these relate to the data obtained from naive native speakers of the languages in question. To this end, two empirical investigations were conducted. The first one is devoted to dictionary definitions, while the second one is an experiment carried out among naive native speakers of the three languages.

1. The Research

1.1. Rendering the Meanings of Basic Colour Terms in Monolingual Dictionaries

The research consists of two parts. The first part will investigate the way monolingual dictionaries cope with defining BCTs. The analysis will be conducted on the level of dictionary micro-structure and proceed from the form of the definition (definition type) to the dictionary content. In this part of the study the following two questions will be addressed: Do the definitions reflect state-of-the-art semantic research?, What kind of knowledge is referred to therein? Eight monolingual dictionaries served as the object of investigation: five general-purpose dictionaries (SOED4, MWCD, SWJP, 広辞苑(Kojien), スーパー大辞林(Sūpā Daijirin)) and three pedagogical ones (CALD, LDCE, ISJP)[4].

1.1.1. Definition types

Apresjan (2000: 69) claims that the best way to define colour terms, both in European and in languages such as Hanunoo is to provide pictures of them as opposed to defining by differentia. Such a defining technique is customarily referred to as ostension.

The analysis of the eight dictionaries shows that most definitions take advantage of both the classic and ostensive type. As regards the former, in most cases the hyperonym *colour* is used. The differentiating features often refer to the region in the colour spectrum where a given colour can be seen or other physical properties. Another way of rendering the differentiae is

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[1] Alcmeon of Crotona (5 century BC) might have been the first to juxtapose black and white in his poetry, a work which has spurred subsequent interest in the peculiarities of colours (Gage 2008).

[2] Browsing through the plethora of papers it seems that finding publications relating both colour research and the theory and practice of making dictionaries is close to impossible. However, to do justice to Barrat and Kontra (1996), one must mention their research aimed at comparing Hungarian and English colour terms and devoting a section of their article to suggesting possible improvements to dictionary definitions (bilingual Hungarian-English and English-Hungarian).

[3] As recognised by Berlin and Kay (1969), i.e. white, black, red, green, yellow, blue, brown, pink, purple, orange and gray.

[4] See the reference section for full titles of the dictionaries.

by pointing to an example (or a feature of an example) in the extralinguistic reality. The majority of the analysed dictionaries find the combination of the classic and ostensive type useful in defining the first seven BCTs on average. A departure from this amalgamation of definition types can be observed in the last four colour terms. ISJP and SOED are the only two dictionaries which consistently follow the defining pattern adopted in the first seven colour terms with the exception of 'pink'.

If the extralinguistic entities referred to in the definitions can be equated with linguistic prototypes of colours then such a situation could have been expected. Waszakowa (2000: 23) claims that the last four colour categories are mixtures of colours for which finding a prototype is not possible. Moreover, she adds that the mixed colours cannot be considered basic as they do not have prototypes (Waszakowa 2000: 26). This somehow contradicts the data one finds in dictionaries such as ISJP and SOED - the two dictionaries list supposed prototypes. Of course, the degree of accuracy can be questioned here. SOED, for example, lists the prototype of *blood* for both 'red' and 'purple', which could lead to the erroneous conclusion that these colour terms denote the same colour. ISJP seems to be free from such deficiencies; the choice of prototypes seems to have been thoroughly thought-out in this case. The dictionary fails to provide any examples only in the case of 'pink'. However, although スーパー大辞林 (Sūpā Daijirin) does not list any examples for, for instance, 茶色 (chairo) 'brown' and 橙色 (daidaiiro) 'orange', it suggests one for 桃色 (momoiro) 'pink' which is 桃 (momo) 'peach'.

1.1.2. Extralinguistic entities (prototypes) referred to
At this point, an important question arises, namely to what degree dictionary definitions of BCTs correspond to the state of the art in semantic research. The term *prototype* is assumed to be understood as the best, i.e. most typical and widespread example of a given colour category (e.g. Wierzbicka 1996). An analysis of the definitions in the eight dictionaries are presented in Table 1.

colour/ dictionary	SOED	MW	CALD2	LDCE	Colour/ dictionary	SWJP	ISJP	Colour/ dictionary	広辞苑 (Kojien)	スーパー大辞林 (Sūpā Daijirin)
BLACK	-	-	night without light	coal or night	CZARNY 'black'	sadza 'soot'	węgiel 'coal'	黒 (kuro) 'black'	黒 (kuro) 'black'	墨 (sumi) 'ink'
WHITE	fresh milk or snow	new snow or milk	snow, milk or bone	milk, salt or snow	BIAŁY 'white'	świeży śnieg 'fresh snow'	śneg 'snow' ,mleko 'milk'	白 (shiro) 'white'	白 (shiro) 'white'	雪 'yuki' 'snow'
RED	blood, ruby	blood, ruby	fresh blood	blood	CZERWONY 'red'	krew 'blood'	krew 'blood', dojrzały pomidor ''ripe tomato'	赤 (aka) 'red'	人 の血や夕焼け空 のよう な色である (hito no chi ya yuuyakezora no you na iro de aru)'colour of human blood or sky at sunset'	血 (chi) 'blood'
YELLOW	butter, egg-yolk, gold or a lemon	lemon, sunflower	lemon, gold or the sun	butter or the middle part of an egg	ŻÓŁTY 'yellow'	żółtko 'yolk' ,cytryna 'lemon' , jaskier 'buttercup'	cytryna 'lemon' , żółtka jajek 'yolks of eggs'	黄色 (kiro) 'yellow'	-	-
GREEN	grass, foliage, an emerald	growing fresh grass or of the emerald	grass	grass, leaves	ZIELONY 'green'	świeża trawa 'fresh grass'	trawa 'grass' ,świeże liście 'fresh leaves'	緑 (midori) 'green'	葉 (ha) 'leaves'	春・夏の木の葉や草ー はる・なつのきのはやくさ (haru, natsu no ki no ha ya kusa) 'leaves of trees or/and grass in spring and summer'
BLUE	sky, deep sea	clear sky	sky without clouds on a bright day, or a darker or lighter variety of this	the sky or the sea on a fine day	NIEBIESKI 'blue'	bezchmurne, sloneczne niebo 'cloudness sunny sky'	pogodne niebo 'clear sky'	青 (ao) 'blue'	晴れた日の空 (hareta hi no sora) 'clear sky'	晴れた日の空 (hareta hi no sora) 'clear sky'
BROWN	-	-	chocolate or earth	earth, wood, coffee	BRĄZOWY 'brown'	brąz 'bronze'	pień drzewa 'trunk of a tree', ziemia 'soil, ground, earth', kasztan	茶色 (chairo)	-	-

							'chestnut'	**'brown'**		
PURPLE	blood (!)	-	-	-	**FIOLETOWY 'purple'**	-	wrzos 'heather', fiołki 'violets'	紫色 **(murasakiiro) 'purple'**	紫 (murasaki) 'gromwell'	紫 (murasaki) 'gromwell'
PINK	-	-	-	-	**RÓŻOWY 'pink'**	-	-	桃色 **(momoiro) 'pink'**	'桃 (momo) 'peach'	桃 (momo) 'peach'
ORANGE	orange	orange	-	-	**POMARAŃCZOWY 'orange'**	owoc pomarańczy 'fruit of an orange'	dojrzała pomarańcza 'ripe orange'	橙色 **(daidaiiro) 'orange'**	_5	-
GREY	sunless sky, ash, lead	-	rain clouds	dark clouds	**SZARY 'grey'**	-	chmury deszczowe 'rainy clouds'	灰色 **(haiiro) 'grey'**	灰 (hai) 'ash'	灰 (hai) 'ash'

Table 1. Extralinguistic objects referred to

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[5] Only a cross-reference to 橙 (daidai) 'orange'

BLACK and WHITE

Out of the eleven BCTs the two achromatic colours deserve special attention. 'Black' and 'white' seem to exhibit features not present in the semantic structure of the remaining BCTs, namely they can be analysed *quantitatively* and *qualitatively* (e.g. Tokarski 2004, Teodorowicz-Hellman 1997). The quantity of a colour pertains to the possibility of a colour understood in terms of its brightness (e.g. *biały* 'white' as 'bright' in Polish) and quality to the hue ('white' as the 'white hue'). With this distinction in mind, researchers recognise two separate prototypical extensions for both 'white' and 'black'. Generally, quantitative white is said to refer to *day*[6] and qualitative white to *snow*. In the actual lexicographic practice, only *snow* is used, in many cases modified by *fresh* or *new*. Apart from this prototype, others are offered, such as *milk, bone* and *salt*. All of them seem to be of equal basicness as far as human experience is considered. After all, everyone has drunk milk, eaten (or seen) salt and everyone's body is composed of bones. *Snow*, at least in the case of English pedagogical dictionaries, constitutes a more dubious case. Dictionaries such as CALD or LDOCE are targeted at a broad audience, some of whom may have no experience of snow. For this reason, the addition of *milk* or *bone* to be a reasonable solution. As to the quantitative-qualitative dichotomy, it is crucial to notice that white and *biały* 'white' differ semantically to some degree. It seems that the association of 'biały' with *day* is more immediate in the case of Polish as *biały dzień*[7] (literally: 'white day') is a very frequent collocation. By contrast, *white day*, even though it returns a significant number of records in Google (c. 13.000), does not refer to brightness, most probably due to the fact that Engish speakers have the phrase 'in broad daylight' at their disposal, which means roughly the same as *w biały dzień* 'in white day'. From this perspective, it seems that English lacks the unanimously recognised prototype of quantitative white. Moreover, it seems hazardous to say that the English associate 'white' with light as Wierzbicka (1996) does. Nevertheless, when one assumes that the quantity-quality distinction is valid, the data presented in dictionaries turns out to be somewhat surprising. Out of the eight analysed dictionaries only five (MWCD, SOED, SWJP, Kojien and SūpāDaijirin refer to the brightness of the colour. A closer look at the definitions in the two Japanese dictionaries reveals that the quantitative-qualitative distinction can be valid in the case of this language as well. SūpāDaijirin refers to the reflected rays of light and, what seems of some importance, includes this information in the colour sense. The qualitative meaning of 白 (shiro) 'white' in Kojien is presented in a separate sense and defined as 明るい (akarui) 'bright' and 輝いている(kagayaiteiru) 'shining'. Judging solely from the dictionary definitions it could be tentatively stated that in Japanese the *bona fide* example of quantitative 'white' is the 'rays of light' while the qualitative 'white' is best exemplified by 'snow'. The second of the achromatic colours – 'black' – can be subjected to the quantitative-qualitative analysis as well. The semantic architecture of 'black' is, however, far less complicated than this of 'white'. Some semanticists agree that '(pitch black) night' constitutes the prototype for both the quantitative and qualitative 'black' (e.g. Wierzbicka 1996, Tokarski 2004). This time, two of the dictionaries use this prototype (CALD and LDOCE). Moreover, as CALD

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[6] This seems to be language-specific. Teodorowicz-Hellman (1997) argues that the prototype of white in Swedish needs to be changed from 'day' to 'light' and 'brightness', as days are for some periods of time more like nights due to geographical situation.

[7] There are 370 records of *biały dzień* ('white day') in the IPI PAN corpus (available at www.kurpus.pl)

suggests, *night* can be postmodified by *without light* to ensure the quality of the ideal 'black'. SOED and MWCD abandon the ostensive definition in favour of an encyclopaedic one. The remaining two dictionaries, i.e. SWJP and ISJP, employ the prototypes of *sadza* 'soot' and *węgiel* 'coal', respectively. The two Japanese dictionaries use the examples of 墨 (sumi) 'ink' and SūpāDaijirin additionally lists 木炭 (mokutan) 'charcoal'. Both of these examples are foreign at least to the Polish native speaker as 'blue' is the colour of 'ink' thought of most often. Moreover, 'charcoal' is less familiar to this language group than 'coal'. Hence, all the definitions might be considered counterintuitive when juxtaposed with the outcomes of linguistic research. This is because, according to semanticists, *night* seems to be the perfect candidate for the prototype of 'black' as every human must have experienced it. Then, if it is so widespread and, as a consequence, common to all people, why would lexicographers choose to neglect this fact? There is no readily available answer. One more issue related to the two achromatic CTs is the supposed relation of antonymy between them. Tokarski (2004)[8] argues that the antonymy between 'czarny' and 'biały' is not symmetrical, due to different prototypes of 'biały' in the quantitative and qualitative sense and the connotations that they produce. This might be a good argument against introducing definitions emphasising such a semantic relationship between these CTs into dictionaries[9]. Yet, Tokarski (2004) assumes that the prototypes he mentions are the only correct ones. Elaborating on the connotations of *dzień* 'day', *śnieg* 'snow' and *noc* 'night' he finds the predominant element of *śnieg* 'snow' (and its connotations) in 'biały' incompatible with 'noc' (and its connotations). This might be a bit too far-fetched, as there can be more than one prototype of a given colour term. Assuming a broader definition of a prototype to include the most common extralinguistic entities, it is 'night' as well as 'soot' and 'coal' which can be taken as the legitimate prototypes of 'black' (each of them with their idiosyncratic connotations)[10]. Until a satisfactory semantic analysis of the two colours is carried out, with more than one prototype considered, no postulates can be made as to whether to indicate the allegedly antonymous relation between 'black' and 'white'.

GREEN and BLUE
In the course of semantic analysis of 'green' some researchers have wondered whether the meaning of this terms should be a derivative of the meanings of 'blue' and 'yellow'. The reason for such an interpretation is that *green* is the effect of mixing the two colours. However, consensus has been reached that 'green' should be analysed on its own as the explications of its meaning seem to have nothing in common either with 'blue' or with 'yellow' (Teodorowicz-Hellman 2000, Tokarski 2004, Wierzbicka 1996). Most semanticists point to *fresh grass*, or more generally to things growing out of the ground (Wierzbicka 1996), as the most prototypical example of 'green'. This is generally reflected in the definitions. Each of them mentions *grass*, in two cases it is modified by *fresh* (MW and SWJP); ISJP uses the same modifier but in combination with *liście* 'leaves'. In Japanese, there is a substantial difference between fresh and older grass and leaves. Namely, freshly

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[8] Tokarski's (2004) analysis can be regarded as controversial because a significant portion of the analysed material is poetry. It seems that artistic language and the meanings of words as well as connotations contained therein should not be projected on everyday language and set up as norms.

[9] At least in the case of Polish as Tokarski's analysis pertains to Polish only.

[10] For Kleiber (2003) prototypicality is a matter of degree. Therefore, it seems reasonable to postulate the existence of more than one best example in case of colour terms.

grown grass is referred to as *aoi* (青い) but other greens are likely to be called *midori* (緑). This distinction does not seem valid in the case of the other two languages. Otherwise, such distinction would be expected to appear in semantic analyses. Only SūpāDaijirin provides a more elaborate description of the examples of 緑 (midori) 'green' referring the dictionary user to 春・夏の木の葉や草 – はる・なつのきのはやくさ (haru, natsu no ki no ha ya kusa) 'leaves of trees or/and grass in spring and summer'. Another colour term, perceptually as well as linguistically related to 'green', is 'blue'. Many languages do not draw a clear demarcation line between the use of these two terms. This is the case with Japanese, whose 緑 (midori) 'green' and 青 (ao) 'blue' have been widely discussed in the literature. Wierzbicka (1996) notices that 青 (ao) 'blue' differs from English *blue* as it can also denote some hues of green. Stanlaw (1997) as well as Wierzbicka (1996) mention the peculiar way of referring to the 'go light' on the traffic lights. Although, the colour of the 'go light' is roughly the same as the one in the USA (Stanlaw 1997) and the one in Poland (personal information), Japanese refer to it using 青 (ao) 'blue'. This, however, seems to be only a conventionalised way of referring to this specific object (personal information). It also seems that younger generations tend to use 緑 (midori) 'green' in relation to genuinely green vegetables more often, whereas older generations prefer the term 青 (ao) 'blue'[11]. As for English, the term 'blue' covers a wider range of the colour spectrum than the Polish one. What Poles call *niebieski* 'blue' differs from 'blue', as 'blue' extends into the darker shades of *niebieski* 'blue'. Therefore, Wierzbicka suggested *sky* and *water* as the two prototypes for the English and only *sky* for the Polish term, which was accepted by the semantic community (e.g. Teodorowicz-Hellman 2000, Tokarski 2004). These analyses are to some extent mirrored in the dictionary definitions. Each of the definition in the English dictionaries examined refers to *the sky* modified either by *clear* or by a prepositional phrase *on a fine/bright day*. One exception to this theory-practice mapping is SOED, which leaves *sky* unmodified, yet additionally lists *deep sea*. However, it seems that this does not affect the quality of the definition as all relevant brightness levels have been covered. The situation is more complicated in the case of the MWCD definition which does not provide any other prototype than *clear sky*, which might wrongly suggest that 'blue' does not extend into darker hues. In Polish, a full correspondence between semantics and lexicography can be noticed: *niebieski* 'blue' was defined only in terms of *pogodne/bezchmurne/słoneczne niebo* 'clear/cloudless sky', and Japanese definitions mirror the ones just discussed as SūpāDaijirin and Kojien list 晴れた日の空 (hareta hi no sora) *clear sky* as well.

RED and YELLOW
In the case of 'red' the number of prototypical references amounts to two. Semanticists find it difficult to decide on the primary prototype between 'blood' and 'fire' (Wierzbicka 1996, Tokarski 2004). Yet, it is difficult to account for the choice of the two. Although 'blood' is undoubtedly red, no specific explanation has been provided in favour of it. Wierzbicka does not base her intuitions on any kind of evidence, and Tokarski using introspection, Wierzbicka's analysis and poetry, does not remedy the situation. It seems that there exists a

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[11] Younger participants of my experiment told me that they would opt for 青 (ao) 'blue' in relation to vegetables only when they want to emphasise that they are fresh.

need for more empirically-based study. Nonetheless, taking a look at the dictionary entries one immediately notices the presence of *blood* in every definition, which in CALD is modified by *fresh*. This is supplemented by *ruby* in SOED and MWCD and complemented with *dojrzały pomidor* 'ripe tomato' in ISJP. As for the Polish context, the choice of a *ripe tomato* seems a good idea as it is highly possible that *blood* working in tandem with *pomidor* 'tomato' will lead the dictionary user to the proper denotatum of 'red'. As for the Japanese context, 血 (chi) 'blood' modified by 人 (hito) 'human' is also used in Kojien. However, what is striking in the definition of 'red' in this dictionary is that it points to the 夕焼け空 (yuuyakezora) 'sky at sunset' as the second best example. This provides some insight into the exceptional (from the European viewpoint) semantics of this lexical item. It appears that not only does it denote what Polish and English call 'red' but also extends to shades of 'orange' and *pomarańczowy* 'orange' as well as 'pink' and *różowy* 'pink'. It is not until the reader gets to the remaining part of this definition and also the definition offered by Sūpā Daijirin that they learn that 赤 (aka) 'red' is used as an umbrella term for 桃色 (momoiro) 'pink', 橙色 (daidaiiro), あずき色 (azukiiro) 'adzuki bean-colour' and 茶色 (chairo) 'brown'[12].

A large discrepancy can be noticed between linguistics and lexicography in the case of 'yellow'. Semantists (Wierzbicka 1996, Tokarski 2004) suggest that the prototypical extension of this colour is 'sun' both for Polish and English, but such data cannot be found in the examined dictionaries with the sole exception of CALD. When the dictionary data is compared cross-linguistically certain overlaps can be observed among Polish and English: dictionaries of these languages list both *egg yolks* and *lemon*. Unfortunately, no examples are provided in the Japanese dictionaries.

The neglected: mixed colours
While semantic analyses have contributed to our better understanding of the six colour terms discussed above and undoubtedly offer significant help in the process of compiling dictionary definitions, they fail to support lexicographers in the case of the remaining six colour terms. 'Brown', 'purple', 'pink', 'orange' and 'grey' are said to be mixtures of the other colours present in the Berlin and Kay (1969) hierarchy. Tokarski (2004: 135), for instance, tentatively suggests the following conceptualisation through the first six primary colours:

> różowy 'pink' = czerwony 'red' + biały 'white'
> pomarańczowy 'orange' = żółty 'yellow' + czerwony 'red'
> fioletowy 'purple' = niebieski 'blue' + czerwony 'red'
> brązowy 'brown' = czarny 'black' + żółty 'yellow' + czerwony 'red'

It appears that there is some controversy surrounding the explication of 'brown'. Wierzbicka (1996) claims that in contrast to 'pink', 'orange' and 'purple', 'brown' can be explained in relation to human basic experiences; she suggests that the prototype of brown in English as well as in many other languages is 'ground'. To a certain extent this is corroborated in the definitions which underwent the present analysis. CALD and LDCE list *earth* and so does ISJP. However, the remaining books of reference either do not list prototypes at all (Japanese dictionaries, SOED and MWCD) or provide other examples (SWJP offers brąz 'bronze'). While *earth* or *ziemia* 'earth, soil, ground' in certain circumstances can be brown, the other extralinguistic entities referred to are worthy of some interest as they might turn out to be

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[12] Such situation goes unnoticed in bilingual dictionaries of Japanese PKJD, OBJD (both EJE) and SJP (JP) where the equivalent of *red* (in the first two dictionaries) and *czerwony* in SJP are listed.

misleading to some extent. Some dictionaries opt for other exemplars, such as *chocolate*, *wood*, *coffee*, *tree trunk* and a *chestnut*. On their own these seem to be ambiguous, however, if they are provided together, a dictionary user is very likely to grasp the concept of 'brown'.

1.1.3. Conclusion

A careful analysis revealed that most exemplars in the extralinguistic reality referred to in the dictionary microstructures seem to fit the idea of linguistic prototypes. These, consequently, should be considered language (and therefore culture) specific. Also noteworthy is the fact that some lexicographic products seem to put more effort in consistently providing definitions of the same type (ISJP is the ideal in this respect). For this reason, it seems advisable to consult dictionaries when carrying out semantic analyses, yet not without critical thinking. All in all, it appears that the more recent a dictionary edition, the more reliable it strives to be. However, there is still some room for innovation. Improvements or solutions to dictionary-related problems can be sought with the help of the so-called naïve users of language. Many such studies have already been conducted with relation to dictionary use (e.g. Lew 2004, Lew and Dziemianko 2006a, 2006b), however, none seem to concentrate exclusively on issues related to culture and perception. Colour terms, their perception and definitions undoubtedly constitute such a no-man's-land. The following part of the present study sought to illustrate the usefulness of empirically-gained data in lexicographic practice.

1.2. Probing native intuition

Twenty-two Japanese (14 female and 8 male), American (13 female and 9 male) and Polish (16 female and 6 male) subjects participated in the study proper. They were selected from seventy-three participants on the basis of a questionnaire which helped to match them according to their age, linguistic background and their lack of professional interest in colours. Mean age was 31, 25 and 30 for each of the groups respectively. The experiment was composed of two parts.

Part one: the subjects were asked to name twenty-eight colour terms when looking at individually presented coloured sheets of paper. All of the colours belong to the basic set in the Paint application and were printed on A4 sheets of paper (covering the whole surface of an individual sheet). Printing guarantees that nearly-identical printouts are possible, thus making the experiment replicable[13]. Such stimuli were thought to suit the aims of the research best by making it replicable. As opposed to the Munsell colour chart, the colours were accessed individually, one at a time. In this way, consistency in colour naming could be measured. All of the stimuli were printed in the CMYK technology[14]

Part two: eleven basic colour terms in the subject's native language were presented on a sheet of paper together with the instructions which asked to provide as many associations with a given colour as possible (yet no less than two).

1.2.1. Results: part one

Analysing data obtained in the naming task presents a great challenge, due to the fact that morphologically complex forms were used in order to describe the stimuli. If such raw data had undergone analysis, no conclusions or generalisations would have been possible. For this

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[13] Gatter (2005) explains that creating desired colour differs in case of colours displayed on the computer screens and those on printouts. The former are arrived at by mixing lights (RGB technique) and the latter by mixing pigments (CMYK technique).

[14] Printer specifications: Konica Minolta, printing resolution: 2400 x 1200 dpi, toner: polimerised Simitri® HD

reason, morphologically complex units (mostly compounds) were decomposed into the constituent morphemes and grouped around their morphological head. For example, for names, such as *cornflower blue*, *see blue*, or *bluebird blue*, the head chosen was *blue* with all of the modifiers recorded, but not considered in the further analysis. A linguistically more interesting phenomenon was noticed in the case of Japanese, as more procedures had to be applied in order to classify the Japanese data than in the case of the remaining groups. Names of one colour tended to be written using two different alphabets: hiragana and katakana, irrespectively of the origins of a given term. For instance, みどり(midori) 'green' was written as ミドリ (midori) 'green' for no obvious reason[15]. However, a more challenging problem had to be coped with: whether to treat words, such as グレー (guree) 'grey' and はいいろ(haiiro) 'grey'[16], as two independent concepts and count them as two separate words or treat them as different signifiers for the same signifieds. In the end, these two lexical items (and consequently all analogous cases) were treated as separate items on the list due to the differing degree of semantic information encoded in them (as might be concluded from the dictionary definitions) and different referential range (Stanlaw 1997). By grouping modifiers around the stems of compound colour names, the number of names used was significantly reduced so as to allow generalisations. This approach should not be considered controversial, as it is always the head that designates the most discernible hue, with modifiers playing a far less important role – mostly fine-tuning the signifier. Figure 1. shows the results of the first study. What is striking is the fact that little (if any) unanimity in naming can be observed both within one language group and between the three groups. Different colours pose different degrees of difficulty in naming within one group and across the groups with the highest number for colour no. 12 for Japanese and Polish speakers (12 and 10 names respectively) and colours no. 13 and 23 being equally difficult to name for Americans (10 names for both). What seems noteworthy is that there are only two colours which were named using one identical head across the three languages (colour no. 2 and 3). Also, within each language group, the number of stimuli which were named using one single head is very low – two for the Japanese and Polish and six for the American group.

The arithmetic mean of all the colours used for each language group exhibits a stark contrast between the American group and the remaining two: 3.21 for Americans, 4.85 for Japanese and 4.71 for Poles. The data might seem counterintuitive, as it was either the American and Polish group which would be expected to yield similar results, or the Japanese and American due to the heavy impact of American English lexis on the Japanese language.

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[15] After completing the experiment I learned that Japanese tend to prefer katakana to hiragana in some cases (in fashion catalogues, for example) as they convey the idea of something new and Western (personal communication). Many students of Japanese (including myself) are surprised to come across the word 寿司 (sushi) 'sushi' written with katakana (スシ).

[16] Other cases included such terms as ブルー (buruu) 'blue' and あお (ao) 'blue', レッド (reddo) 'red' and あかい (akai) 'red', グリーン (guriin) 'green' and みどり (midori) 'green.
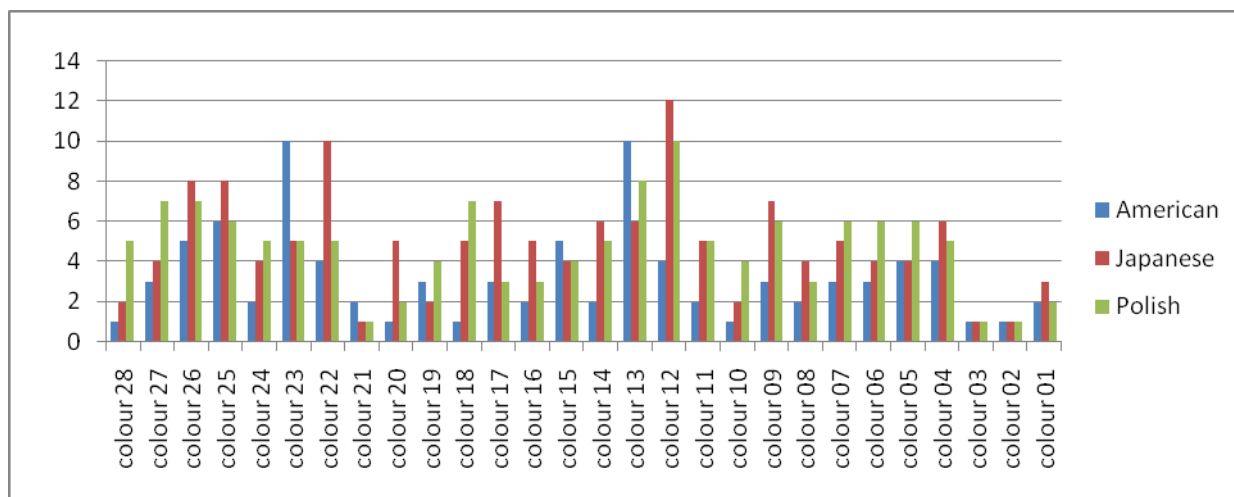
Figure 1. Number of CTs used to name each stimuli

The chi-square test of the relationship between nationality and the number of CTs used revealed statistical significance between: the Japanese and the American in the case of colours number 23 (p= 0.0245), 22 (p= 0.0060), 20 (p= 0.0130), 18 (p= 0.0130), 17 (p=0.0419), 14 (p= 0.0270), and 9 (p= 0.0419), the Polish and the American in the case of colours number 28 (p= 0.0130), 27 (p= 0.0419), 23 (p= 0.0245) and 10 (p= 0.0439) and only two colours between the Japanese and the Polish – number 22 (p= 0.0245) and 17 p= 0.0419). It is clearly visible that the differences are most numerous between the American and the Japanese group. Another observation, which is not directly linked to the hypothesis, is that the subjects used both BCTs as well as non-basic terms interchangeably within one group and across the groups. What for one subject seemed a basic colour, constituted a non-basic colour for another. For instance, colour no. 5 was named *czarny* 'black' three times and *grafitowy* 'graphite' eight times by Polish subjects; the same stimuli were named *black* five times and *gray* five times; in the Japanese group, colour no. 5 was called はいいろ[17] (haiiro) 'grey' seven times and くろ(kuro) 'black' eight times. This regularity, however, might be due to different angles at which the stimuli were presented, i.e. reflected light might have caused differences in the perceived brightness of the stimuli. However, an explanation along similar lines cannot be applied in the case of colour no. 12, which was called by the Polish group *bordowy* 'bordo' nine times and *jasny czerwony* 'light red' two times. The same phenomenon can be observed in colour no. 10, which was called *ciemny niebieski* 'dark blue' three times and *błękitny* 'sky-blue' two times. In these cases, differences referring to brightness range almost from one extreme to the other; this tendency seems language specific, as besides the Polish subjects no other group gave similar responses. A more striking example concerns stimulus no.13, which was named *kawowy z mlekiem* 'coffee-with-milk' by four and *pomarańczowy* 'orange' by two participants. This time the difference concerns hue which cannot be accounted for by the difference in presentation conditions (such as light) and therefore is very surprising. Such cases seem to testify to the fact that colour perception, although undoubtedly neurobiologically based, is subjective, and when lexicalised, refers not merely to the human body and its perceptive abilities but also to a person's experiences with the world. Yet, this conclusion might seem a bit too far-fetched, as it is based on a very few responses and, thus, might be subject-dependent. For instance, the study did not seek to

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[17] The material quoted from the Japanese group is provided either in hiragana or katakana as the subjects were asked to use those alphabets only. This enabled translation of the material for the author.

eliminate people with synaesthesia who might associate numbers listed on the response sheet with visual sensations, such as colours.

1.2.2. Results: part two

The procedure of listing the obtained data was roughly similar to the one adopted in Study 1: modifiers in compound items were grouped around their morphological heads. In order to take a closer look at the non-abstract associations, abstract associations had to be selected and excluded from the final list, which underwent further analysis. It consisted in looking at a maximum of five most frequently named associations and comparing them against the semantic and lexicographic data discussed in the previous sections.

Table 2. below shows that there is a significant agreement as to the associations of all the investigated CTs with the exception of 'pink' and 'purple'. Moreover, in the case of 'black', 'red', 'green', 'blue' and 'brown', the prototypes suggested by Wierzbicka (1996) found their place on the three lists, yet scored a different number of overlaps. What is more striking in the analysis is that there are more overlaps in associations between the American and the Japanese group. For instance, they list, *cloud* for 'white', *apple* for 'red', *trees* and *forest* for 'green', *chocolate* for 'brown', *grapes* for 'purple', *flowers* for 'pink', and finally, *sun* for 'orange'. This seems counterintuitive as the Japanese culture is considered more distant. The chi-square test between nationality and the overlapping associations revealed statistical significance only in case of 'white' ($p=.01824$), 'green' ($p=.03762$), 'yellow' ($p=.00111$), 'blue' ($p=.00006$), 'pink' ($p=.00075$) and 'orange' ($p=,.0000$).

1 WHITE 'BIAŁY'	ŚNIEG 'snow'	MLEKO 'milk'	PRZEBIŚNIEG 'snowdrop'	SUKNIA (# 1, ŚLUBNA 'wedding dress' 1	MĄKA 'flour'	BAŁWAN 'snowman'	1 WHITE	'cloud' (# 15	'snow' (# 6	'paper' (# 3	'paper' (# 1			1 WHITE	clouds (# 8	snow (# 7; flakes 1	sheets (# 3; bed 1;
	13	5	2	2	2	2		15	6	4					8	8	4
2 BLACK 'CZARNY'	NOC 'night,	KOT 'cat'	WĘGIEL 'coal'	ZIEMIA 'soil'			2 BLACK 黒	'hair' (# 4	'hair (head)' (# 4; 'Japanese peoples' ' 1;	'ink' / 'charcoal' (# 6	'evening/night' (# 4			2 BLACK	night (# 10; clouds 1; time 2	eveing	cat (# 2
	6	3	4	4				9		6	4				14		2
3 RED 'CZERWONY'	KREW 'blood'	RÓŻA 'rose'	OGIEŃ 'fire'	SERCE 'heart'			3 RED	'blood' (# 9	'apple' (# 6	'apple' (# 1	'rose' (# 4	'rose' (# 1	'fire' (# 5	3 RED	blood (# 12	apples (# 4	fire (# 3
	10	6	4	4				9	7		5		5		12	4	3
4 GREEN 'ZIELONY'	TRAWA 'grass'	WIOSNA 'spring'	ŁĄKA 'meadow'	JABŁKO 'apple'	SAŁATA 'lettuce'		4 GREEN 緑	'grass' (# 5	'leaf' (# 4	'leaf; foliage' (# 3	'forest' (# 3			4 GREEN	grass (# 14	trees (# 5	Spring (# 4
	17	8	4	3	3			5	4	3	3				14	5	4
5 YELLOW 'ŻÓŁTY'	SŁOŃCE 'sun'	LATO 'summer'	SŁONECZNIK 'sunflower'				5 YELLOW 黄	'flower' (# 4;	'flower' (# 2	'lemon' (# 5	'banana' (# 4			5 YELLOW	sun (# 18	lemon (# 3	spring (# 2
	16	4	3					6		5	4				18	4	2
6 BLUE 'NIEBIESKI;	NIEBO 'sky'	WODA 'water'	MORZE 'sea'				6 BLUE 青	'sky (# 15	'sky' (# 2	'sea' (# 11	'sea' (# 2	'water' (# 4		6 BLUE	sky (# 18	water (# 9	ocean (# 4
	18	11	5					17		13		4			18	9	4
7 BROWN 'BRĄZOWY'	ZIEMIA 'soil'	DRZEWO 'tree'	KORA 'bark'				7 BROWN	'earth/soil' (# 12	'earth/soil' (# 1	'tree' (# 4	— 'chocolate' (# 3	/ 'shit' (# 3		7 BROWN	dirt (# 9	chocolate (# 6	earth (# 5
	10	4	3					13		4	3	3			9	6	5
8 PURPLE 'FIOLETOWY'	FIOŁEK 'violet'	BZY 'lilac'	IRYSY 'iris'				8 PURPLE	'grapes' (# 4	'violet' (# 3	'flower of wisteria' (# 2	'flower' (# 2	'kimono' (# 1	'kimono' (# 1	8 PURPLE	grapes (# 3; juice 1	Barney the dinosaur (# 3	gay / homosexuals (# 3
	5	3	2					4	3	2	2	2			10	3	3
9 PINK 'RÓŻOWY'	DZIECKO 'child'	ŚWINKA (# 2, SKARBONKA 1 'piggy/piggy bank'	RÓŻOWA PANTERA 'pink panther'	BARBIE	CUKIERKI 'sweets'	DODA (proper name of a Polish pop singer)	9 PINK	'peach' (# 8	— 'peach' (# 1	'cherry blossom' (# 8	'flower' (# 2	'flower' (# 2		9 PINK	feminine (# 2 / girls (# 6 ;teenage 1/women (# 1 /girly	flowers (# 5	baby girls (# 4
	4	3	3	3	2	2		9		8	4				10	5	4
10 ORANGE 'POMARAŃCZOWY'	POMARAŃCZE 'oranges'	OWOCE 'fruit'	SŁOŃCE 'sun'	MANDARYNKA 'mandarin'	ZACHÓD SŁOŃCA 'sunset'		10 ORANGE	'mandarin' (# 15	'orange' (# 7	'orange' (# 1	'sun' (# 3			10 ORANGE	fruit (# 9	oranges (# 9	sun (# 2
	12	4	2	2	2			15	8		3				9	9	2
11 GREY 'SZARY'	MYSZY 'mice'	JESIEŃ 'autumn'	ŚCIANA 'wall'	BRUD 'filth'	ZŁA / POCHMURNA POGODA 'bad weather'		11 GREY	'smoke' (# 7	'mouse/rat' (# 3	'rain cloud' (# 3	'cloudy sky' (# 3			11 GREY	sky during rainstorm (# 1 /stormy sky (# 1 / rain clouds (# 1	oldmen's hair / old people's hair (# 2	sidewalks (# 2
	4	3	3	2	2			7	3	3	3				3	2	2

Table 2. Associations across language groups

1.2.3. Lexicography and linguistics vis-à-vis empirical findings

What are the implications of these findings for dictionary-making and the study of language? First of all, looking at the associations for which agreement was quite high, one can notice that the examples referred to in the definitions, linguistic prototypes and the obtained associations differ considerably.

Japanese

In the case of 白 (shiro) 'white' the association is *cloud* rather than *snow*, which is preferred by the dictionaries; the number of overlapping answers is 6 and 15 respectively. Therefore, it might be reasonable to consider including *cloud* as the prototype of Japanese 'white'. In the case of 黒 (kuro) 'black', only *charcoal* is among the most frequently named items. The second dictionary example scores no overlaps, yet another well-recognised example emerges from the data, namely かみのけ (kaminoke) 'hair on the head', which due to the number of overlaps, seems a good candidate for another dictionary example. A similar issue concerns items listed under 赤い (akai) 'red', as *blood* occupies the first place, but *fire* was pointed to merely once. Here, the data suggests that *apples* as well as *roses* might find their way into the dictionary definitions. No controversies were noticed in the case of *green*. The obtained data could, however, improve the definitions of *yellow* in the two analysed dictionaries as they both lack any examples. The subjects pointed to *flowers* as the most typical, yet this seems too broad a category to be considered seriously. The next suggestions are *lemon* and *banana* whose colour is characteristic and constant. Therefore, these might be good candidates for inclusion in the definitions. In the case of 青 (ao) 'blue', apart from *sky*, which is the most frequently named denotatum, also *sea* and *water* seem to qualify. This might indicate that the denotational range of English 'blue' and Japanese 青 (ao) 'blue' is convergent. The Japanese subjects were also somewhat unanimous when it comes to 紫 (murasaki) 'purple', listing *violet*, *grapes*, the *flower of wisteria* and, generally, *flowers*. Perhaps all (except for *flowers*) could be accepted into dictionaries to give a better idea of what this particular colour term designates. In the case of 桃色 (momoiro) 'pink', the ideas of lexicographers and naive Japanese subjects were quite convergent as both refer to *peaches*. However, one more example could be introduced into these microstructures, namely *cherry blossom*, which due to its recognisability, could be of some help (mostly for foreigners using monolingual Japanese dictionaries). Surprisingly, when looking at associations of 橙色 (daidaiiro) 'orange', these are not *oranges* which were named most frequently (they occupy the second position on the list), but *mandarins*. And finally, while lexicographers consider *ash* to be the most appropriate example of 灰色 (haiiro) 'grey', most probably because of the morphological similarity, *smoke* as well as *clouds during rainy weather* are referred to in the study. It seems advisable to consider listing them in dictionaries.

Polish

Biały 'white' was considered by both lexicographers as well as the subjects to be best epitomised by *śnieg* 'snow' and *mleko* 'milk'; yet the postulated semantic prototype of day did not appear. Wierzbicka's (1996) suggestion that *noc* 'night' should be the best example/prototype of *czarny* 'black' has been supported by the obtained data. Also the lexicographic suggestion of *węgiel* 'coal' can be found on the list (third position). *Czerwony* 'red', similarly to the Japanese data and lexicographic practice, was given the association of

krew 'blood' most often. *Róża* 'rose' followed, yet if it was to enter a dictionary definition its colour should be specified[18]. The semanticists' suggestion of *ogień* 'fire' has been listed as the third item; also *pomidor* 'tomato' suggested by ISJP found its way to the list, yet it was not very popular. No controversies were recorded in the case of 'green' and 'yellow'. However, an interesting question emerged when a closer inspection of the associations of *niebieski* 'blue' was performed: Should there be any difference between the denotational ranges of English 'blue' and Polish 'niebieski' (postulated by Wierzbicka (1996))? It was the result of *woda* 'water', *morze* 'sea' and *ocean* 'ocean' associated with this colour. Wierzbicka claims that these examples account for 'blue' extending into darker shades, which is not the case with *niebieski* 'blue' as the Polish language offers *granatowy* 'dark-blue' instead. At this point, a very stimulating question arises: are these results of introspection or empirical tests that should be considered more valid? It seems that empirically gained data (in a methodologically well though-out experiment could be considered superior. In the case of *brązowy* 'brown' and *fioletowy* 'purple', suggestions of ISJP were replicated. *Różowy* 'pink' presented great difficulty both for the lexicographers and the subjects. The latter group gave either very broad categories (such as babies) or proper names (e.g. Doda, Różowa Pantera 'Pink Panther'). *Pomarańczowy* 'orange' was intuitively associated with *pomarańcza* 'orange' (fruit). Unlike in the Japanese sample, Poles also had problems when trying to associate things with 'grey'; here *myszy* 'mice' were most frequent (12%), with the remaining examples which could qualify for the inclusion into dictionary definitions named only once.

American
As far as 'white' is concerned, in this language group neither the semanticists nor the lexicographers (at large) mirrored the responses to the experiment. From the dictionary examples, only *snow* can be located on the list. An equal number of overlaps is recorded in the case of *clouds* which modified by, for instance, *on a fine day* could qualify as an additional example. In the case of 'black', lexicographers, semanticists, as well as naive language users agreed to the example of *night* as the most prototypical one (*coal* suggested by LDCE was mentioned only once). Similarly in the case of 'red', *blood* was agreed on by the three groups. *Fire* (a suggestion put forward by the semanticists) was mentioned only three times and it seems reasonable not to include it in dictionaries. As with the other language groups, 'green' does not require any analysis due to the fact that dictionaries, linguists and the subjects of the study are inclined to accept *grass* (40%) and *leaves* (or any other green parts of plants) as good examples. Similarly to the Polish data, *the sun* is associated with 'yellow', but not with any fruit (like in Japanese). Also 'blue' seems to have a very similar denotational range, as *sky*, *water*, *ocean* are put forward (as in Wierzbicka's (1996) analysis). When it comes to 'brown', semantic analysis is mirrored to a certain extent, i.e. earth is listed, yet preceded (in the number of overlaps) by *chocolate* and *dirt* as the most salient examples. 'Purple', contrary to the suggestions of SOED offering *blood* again, provides the dictionary user with *grapes* as the only viable suggestion; the rest are either proper nouns or seem to be stereotypically linked to gay people. 'Pink', on similar lines, was again stereotypically associated with girls or women. The only option worth pondering is *grapefruit*, although only three overlapping responses call for further research. As for the two remaining colours, their associations were consonant with those of the Japanese subjects ('orange' – *orange* (fruit), 'grey' – *rainy clouds*).

2. Conclusion

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[18] It might result in a kind of circularity, where the object referred to would be modified by the headword.

Although speakers of the three language groups did not use the same lexical items to name colours and, thus, no tentative universal tendency of encoding CTs across the languages can be assumed, it seems that the colour lexicons in the three languages still exhibit many similarities, i.e. semantic prototypes seem to be to a large extent common to all the language groups. Yet, some exceptional cases of culture specific items have also been recorded. There seems to be no doubt about the reciprocal relationship between linguistics and lexicography. If these are assumed to be two autonomous disciplines, results of research conducted in each of the areas might help the other, or at least indicate directions in which further research should be pursued.

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