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COLOUR PSYCHOLOGY
IN THE GRAECO-ROMAN
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EIGHT PAPERS FOLLOWED BY A DISCUSSION AND AN EPILOGUE
by

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ÉPILOGUE

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FROM THEN TO NOW — FROM NOW TO THEN

CONTEMPORARY RESEARCH IN PSYCHOLOGY MIGHT INFORM
RESEARCH ON AFFECTIVE COLOUR MEANING IN ANCIENT GREEK
AND ROMAN WRITINGS*

Colour is a sensory experience that helps us navigate in our environment. Colour adds contrast and facilitates our search for objects of interest. We can easily spot ripe fruit on a tree, and stop quickly in front of a red traffic light. Using the right colour or colour combinations, we can camouflage people, animals, or objects to protect them in hostile environments. In addition, colour carries meaning beyond channelling our attention. We like or dislike colours, we use particular colours for particular events (e.g., white for weddings in many contemporary western societies), and add colours to our environment to shape it according to our liking (e.g., clothes, furniture, and decorations). Moreover, popular assumptions claim that colours can be used to impact psychological functioning, and one can find many such claims in the public domain. One such example is the following, “Colours are very important in our lives as they directly influence our well-being and mood. Each of us has his own range of popular colours and colours that do

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not respond to him. Consequently, the colourful world around us affects our health”.¹ In our research, we aim to shed light on such assumptions, particularly those concerning the link between colour and affect. We aim for a comprehensive description of colour-affect relationships, but also for their causal explanations. To achieve this aim, we have to deal with the complexities of colour and affect as well as their interactions. We highlight some of the challenges of this research in the hopes that they will be informative to scholars who research how colour and emotion were linked in antiquity. This chapter provides an overview of how we define and work with colour, what we understand under the terms ‘emotion’ and ‘affect’, and how we approach the study of colour-affect relationships in contemporary societies. Throughout this process, we endeavour to remain attentive to situations that scholars working with ancient texts are likely to encounter in their work.

1. Colour

Colour is a complex phenomenon. First and foremost, we *see* colours, but we also *talk* and *write* about colours. Contemporary colour research commonly asks researchers to account for the complexity of colour vision. To explain this complexity, we should consider some basic neural processing stages. Colour vision in humans starts when light, reflected by or emitted from an object, excites light-sensitive receptors (‘cones’) in the retina, located at the back of the eyeball. Afterwards, this colour-related information is transferred via additional neuronal connections to the visual cortex of the brain so that complete colour perception can arise.² Today, colour perception, which is the result of colour vision, is described as a combination of three major colour param-

¹ ARCHON, S. (2019), “Colour Psychology: How Colours Affect Your Mood”, in *The Unbounded Spirit*. <<https://theunboundedspirit.com/colour-psychology-how-colours-affect-your-mood/>>. Accessed 21 January 2020>.

² STOCKMAN / BRAINARD (2015); GEGENFURTNER / ENNIS (2016).

eters coined saturation, lightness, and hue.³ Of these, hue is the parameter which laypeople commonly refer to as colour, and thus when we see or talk about colours such as blue, red, or green, we are in fact talking about different hues. By contrast, saturation — also called chroma or colourfulness — refers to the vividness or purity of a ‘colour.’ Some colours can appear greyish, muddy, or pastel, indicating that they have low saturation, while others may be bright, clean, or pure, meaning they have high saturation. Finally, lightness — also called brightness, shade, or value — refers to the degree that a colour is light or dark. Every colour, whatever its hue, can be light or dark, saturated or desaturated.

The colour parameters of hue, saturation, and lightness are not independent from each other. Using yellow and blue, we exemplify how colour parameters are inter-dependent. Imagine that you select the best example of yellow, which will most likely be both quite light and saturated. Now, try to select a blue that has both the same saturation and lightness as your yellow. When doing so, you will realise that you are unable to select such a blue, and would instead be limited to selecting a blue that is either darker but equally saturated as your yellow, or a blue that is equally light but less saturated than your yellow.⁴ Hence, if you wanted to have a saturated blue and a saturated yellow of the same lightness, you would have to select a darker yellow to match the blue. This yellow, however, would be closer to brown than to ‘sunny’ prototypical yellows (Fig. 9.1). Psychologists studying colour experiences today can target psychological responses to ‘yellow’ and ‘blue’, but have to also account for such inter-dependencies of colour parameters (e.g., see n. 5). Commonly, we account for colour parameters by relying on conventional colour models. Some of these models are perceptually uniform and resemble human colour perception (e.g., Munsell Colour System, *CIE Lab*, or DKL colour space; Fig. 9.1), while others are

³ HUNT / POINTER (42011).

⁴ MUNSELL (1912).

⁵ SCHLOSS / WITZEL / LAI (2020); VALDEZ / MEHRABIAN (1994).

not perceptually uniform, and often depend on the hardware used to produce the colour (e.g. RGB, HSB, or CMYK).

We assume that researchers who are interested in how humans experienced colour in the past do not have to deal with such perceptual complexities, and instead rely on the available but inevitably limited record of ancient sensoriality. Scholars of antiquity, for instance, can turn to paintings, buildings, or sculptures to explore the use and perception of colour, but these relics as preserved today may not depict what people saw when they were created.⁶ Instead, scholars are only able to engage with such aspects of cultural heritage after years of changes due to environmental forces and human activity. Research may also focus on descriptions of such cultural objects without always knowing whether they truly existed or were only a source of imagination.⁷ Written sources are helpful more broadly, allowing researchers to look for both the vocabulary of colour and terms that describe particular colour-related sensory properties of living and non-living entities. Colour descriptions have been used, for instance, to describe local biology and botany, body functioning, gemstones, paintings, rituals, cultural goods and customs (see contributions in this volume). Obviously, researchers have to consider that the meanings of colour terms have constantly changed over time, and they must remain critical in their assessment of what these words or phrases meant both at the times when they were written and translated.

One might be tempted to infer the meaning of an unknown word based on the meaning of a similar and familiar word.⁸ If we take the Middle English term *rēd* as an example, we might be tempted to simply match its meaning to the Modern English word *red*. Yet, the Middle English basic term *rēd* encompasses a larger spectrum of reddish colours than the Modern English basic term *red*, including various shades of red, purple, crimson, scarlet,

⁶ ROUVERET in this vol.; JOCKEY (2015).

⁷ ROUVERET in this vol.

⁸ BIGGAM (2012a).

and pink.⁹ In particular, colour terms seem to lose their original meaning as new basic terms are introduced.¹⁰ To stay with our example, the Middle English term *rēd* lost its meaning of pink and purple when specific basic terms for those shades of red became more widely used in Modern English. Similarly, the term purple (*purpura*) in ancient Greek or Roman texts cannot be directly translated into the Modern English term *purple*. *Purpura* refers to a large variety of colours, from dark red to blue, and was not restricted to the modern understanding of bluish-reddish colours of the basic colour term *purple*.¹¹ Modern languages are constantly changing too. As some colour terms, like *turquoise*, *lavender* or *peach*, become more widely used and potentially reach the status of a basic colour term, the existing basic colour terms would become more and more specific in their meaning.¹²

On the basis of our admittedly limited knowledge of historical texts — including texts from antiquity — we also conclude that contemporary understanding of colour terms seems more specific than their understanding in earlier times. Many earlier colour terms refer to a larger array of colours as well as to characteristics above and beyond hue, saturation, and lightness. For instance, early Indo-European terms for *red* or *yellow* also described brightness, shininess or glitteriness.¹³ Similarly, certain colour terms in classical Greek or Roman writings additionally included colour properties such as shininess, luminosity, or brightness.¹⁴ For example, both the Greek term *chloris* and the Latin term *uiridis* often refer to green hue, however both are also regularly invoked to refer to non-hue qualities such as life, freshness, moisture, or un-ripeness.¹⁵ Bradley argued “that early categories of colour are tied to primary experiences and are then applied more loosely

⁹ BIGGAM (2010).

¹⁰ BIGGAM (2012b).

¹¹ WHARTON in this vol.; BRADLEY (2009).

¹² MYLONAS / MACDONALD (2015); LINDSEY / BROWN (2014).

¹³ BIGGAM (2012b).

¹⁴ GRAND-CLÉMENT in this vol.; LYONS (1999).

¹⁵ IRWIN (1974); BRADLEY (2009); WHARTON (2016).

and creatively to other phenomena across time. However, rather than thinking in terms of an abstract prototype at the centre of ancient colour experiences, it contests that colours were associated primarily with specific, distinct objects".¹⁶ Some living languages, often in small-scale societies, still describe properties like shininess, wetness, dryness, or fading through their colour terms.¹⁷ In contrast, modern languages in industrialised societies seem to have colour terms almost exclusively focused on hue.¹⁸

Given these differences in the meaning of colour terms across time, it may seem that understanding the meaning of colour and colour terms is easier in contemporary colour research than it is in studies of these topics in the past. In research focusing on contemporary subjects, we can ask participants to look at colours in real time. Referring to actual colours or their terms, we can ask how participants understand colour, think about colour, and categorise colours. For example, we could expect that all native English speakers would understand what the term *red* describes, namely all shades of 'reddish' colours. But are these expectations met? As we will show, the answer is only a *partial yes*.

Speakers of the same language name colours consistently by using a handful of colour terms.¹⁹ This generally consists in 11 or 12 terms, known henceforth as 'basic colour terms', that are sufficient to categorise all perceived colours in many Indo-European languages.²⁰ Yet, this general understanding does not necessarily imply that we know what a 'reddish' colour means to each individual or even a group of individuals. We cannot be certain which of the many shades of red an individual or a group would actually judge to be red. This uncertainty is particularly true when red(-dish) colours approach shades of purple, pink, or orange. We then observe variability in where speakers draw boundaries between two neighbouring colour

¹⁶ BRADLEY (2014) 131.

¹⁷ CONKLIN (1986).

¹⁸ CASSON (1994).

¹⁹ STURGES / WHITFIELD (1995); BIMLER / UUSKÜLA (2018).

²⁰ BERLIN / KAY (1969); UUSKÜLA / BIMLER (2016a); PARAMEI (2005).

terms.²¹ In American English speakers, the largest variability was at the boundaries between *blue* and *green*, *purple* and *pink*, and *red* and *pink*²² (Fig. 9.1). While naming colours around colour boundaries may cause some disagreements, speakers of the same language seem to agree on which actual colours represent the best examples of each colour category (e.g., what is the most typical ‘red’). These best examples, often called ‘focal colours,’ are similar for speakers of the same language and of different modern languages²³ (but see also n. ²⁴). Taken together, contemporary colour researchers experience various challenges in trying to understand how perceptual colour experience is related to colour naming and meaning. Such relationships are less controversial near the best examples of each colour category and become fuzzier and more debated near the borders between two neighbouring colour categories.

2. Emotions and affect

Colour meaning can refer to the shades of colour described by the same colour term, but it can also refer to its psychological or emotional meaning. Here, we are at the heart of this year’s topic of the 66th *Entretiens sur l’Antiquité classique de la Fondation Hardt* entitled “Colour Psychology in the Graeco-Roman World”. A priori, the focus was set on the link between colour and emotion. From the perspective of the contemporary cognitive psychologist, we would not use the term ‘emotion’ for all of the phenomena that the contributors discussed, which are communicated in this collection. We provide a brief overview to detail the contemporary perspective on what is and what is not called an ‘emotion’.

²¹ PARRAGA / AKBARINIA (2016).

²² STURGES / WHITFIELD (1995).

²³ REGIER / KAY / COOK (2005); LINDSEY / BROWN (2014).

²⁴ UUSKÜLA / BIMLER (2016b).

For laypeople, an emotion describes anything to do with feelings.²⁵ For example, we feel an emotion when falling in love, experience stress during an important exam, or when we are startled by spotting a spider on the wall. We can also be considered to be an emotional or an unemotional person, described as impulsive, social, or extraverted. An individual who is generally negative and wary may also be considered emotional by laypeople, likewise when someone loves or hates a certain food, music, or colour. For researchers in cognitive psychology, the affective sciences, and related fields, however, many of these examples do not represent emotions. Instead, from this perspective, we separately define emotions and additional affective phenomena such as moods, preferences, affective dispositions, or interpersonal attitudes. When talking about these affective phenomena together, it is common to group them under the superordinate term of *affect*.²⁶

In considering emotions and other affective phenomena, researchers in the affective sciences define and describe the components of these experiences (see Table 1). Here, the aspect of feeling is only one of several components. An emotional experience involves a situational trigger that provokes an emotional experience. In addition to feelings, the experience likely results in a cognitive evaluation of the situation (*appraisal*), mobilising specific facial, vocal, and bodily expressions. Depending on the emotion, the person might experience changes in her or his physiological response (e.g., sweaty palms, bumping heart, etc.) and behavioural tendencies (e.g., approach or avoidance). Only relevant situations would trigger emotions, causing one's body and mind react to this emotion in synchrony (*response synchronisation*). People change their behaviour in the face of emotions to respond to the situation that caused the emotion (*behavioural responses*). Moreover, emotions change rapidly as one adapts to the new information and re-evaluates the situation (*rapidity of changes*). Hence, emotions are intense but relatively short-lasting, variables gauged by their *intensity* and *duration* respectively.

²⁵ SCHERER (2005).

²⁶ *Ibid.*; DAVIDSON / SCHERER / GOLDSMITH (2003).

To exemplify these components, we use the concrete situation of a person who is afraid of dogs. Seeing a dog on the street would trigger a fear response in this person. The fear response would arise because this person *appraises* the situation as relevant and threatening. The subjective feeling of fear would be accompanied by symptoms including sweating and a faster heartbeat. This person might display a fearful facial expression and have a strong intention to run away, perhaps acting on this in an attempt to flee the fearful environment. In contrast, someone who is not afraid of dogs would not evaluate the situation as relevant or threatening. Instead, this person might actually like dogs and experience joy, a subjective feeling that may also be accompanied by a faster heartbeat. This person might display a smiling face, and have the intention to approach the dog to stroke it. Therefore, people facing the same situation can experience different emotions, or experience no emotion at all, depending on their subjective appraisal of the situation. Toward this, a particularly apt example on the varied experience of love in antiquity can be found in Reitzenstein (in this volume).

Relevant to contemporary research, these components can be weighted and considered when describing and defining different emotions as well as other affective experiences (see Table 1). Mood, for instance, is less often triggered by a particular situation than emotion and does not necessarily lead to a specific behaviour. A person can simply be in a good mood or a bad mood for no particular reason. However, moods are characterized by a longer duration than emotions (Table 1). Similarly, preferences last even longer than moods but are less intense than either moods or emotions. Preferences also involve an important series of elaborate evaluations of particular situations, allowing one to observe and decide whether they like or dislike something (Table 1). Affective dispositions can be understood as stable personality traits or behavioural tendencies with a strong affective core.²⁷ These affective dispositions describe a person's tendency to react in a particular manner (e.g., anxious, hostile, reckless, or entitled). These dispositions

²⁷ SCHERER (2005).

are not related to a particular situation and people consider them to be part of their identity, or what psychologists also call *personality* (Table 1; see also Ierodiakonou in this volume, on the 'personalities' of the chameleon and octopus). Finally, interpersonal attitudes describe styles of communication in social situations (e.g., being polite, distant, or supportive), which affectively colour interpersonal interactions. A person might be trusting and open towards others, while another person might be more distant or cautious. Taken together, affective phenomena differentiate themselves from emotions in terms of what provokes these phenomena, how long they last and how intense they are, and how one reacts when experiencing these phenomena.

Table 1. *Separation of different affective concepts such as emotion, mood, preference, disposition, and interpersonal attitude, based on their components; adapted from Scherer.²⁸ A greater number of dots (•) indicates that this component is of higher importance, strength, or duration to the respective affective phenomenon.*

Components	Emotion	Mood	Preference	Affective disposition	Interpersonal attitude
Situational trigger	••	•	•	•	•••
Cognitive evaluation	••	•	•••	•	•
Response synchronisation	•••	•	•	•	•
Rapidity of changes	••	••	•	•	•••
Behavioural responses	••	•	••	••	•••
Intensity	••	••	•	•	••
Duration		••	•••	•••	••
<i>Examples</i>	Joy/ sadness	Irritable/ depressed	Like/ hate	Nervous/ anxious	Warm/ distant

²⁸ SCHERER (2005).

As shown above, emotions and other affective phenomena can be studied as specific concepts (e.g., fear, joy, or irritability). Alternatively, affective phenomena can be described along the three major affective dimensions of *valence*, *arousal*, and *power*.²⁹ This dimensional approach is used in a variety of settings, for instance, when participants have to rate words,³⁰ pictures,³¹ affective experiences,³² or colours.³³ In all of these cases, valence, also called evaluation, describes the degree to which an object or an event is considered positive or negative, or the degree to which the affective response is pleasant or unpleasant.³⁴ Thus, one can judge affective experiences to be more or less positive (e.g., joy, pride, or relief) or negative (e.g., anger, contempt, or disappointment). Arousal, also called activation, describes the degree of excitation produced by a given stimulus, often ranging from 'calm' to 'excited'. To refer to the same emotions, joy and anger would be classified as arousing emotions while contempt, pride, disappointment, and relief fall in the category of low arousing emotions. It is important to note that arousal and valence are independent dimensions; positive and negative emotions can be more or less arousing. Finally, power, also called potency or dominance, describes one's judgement of having control over a situation. For instance, someone might feel empowered by an experience, provoking them to build from the experience. In contrast, another experience may make someone feel unable to take control or action. Returning to the same sample emotions as above, we categorize joy, anger, contempt, and pride as empowering emotions, while disappointment and relief would be disempowering emotions.

To summarize, we have thus far demonstrated the complexity of colour and affect. A survey of literature on the topic

²⁹ FONTAINE *et al.* (2007); SCHERER (2005).

³⁰ BRADLEY / LANG (1999).

³¹ LAKENS *et al.* (2013).

³² WILMS / OBERFELD (2018).

³³ VALDEZ / MEHRABIAN (1994).

³⁴ ITKES / KRON (2019).

demonstrates a variation in the meaning of colour across time. By inference, the relationship between colour and affect must have also experienced a similar range of meanings across time and space. For instance, one could speculate that broader colour categories (e.g., that the term *red* could also mean pink, purple, or orange) are associated with a broader spectrum of emotions. Below, we present major approaches and challenges of contemporary studies on colour-affect associations. When presenting colour perceptually, we have to deal with its visual properties, and when presenting colour in abstract ways — with words, associations, or metaphors — we have no knowledge which colours people actually imagine. The complexity of both colour and affect does not render their relationship easier to study and understand.

3. Colour and affect

Contemporary researchers have explored whether colours carry affective connotations from different perspectives. The most common approaches have been to study colour-emotion associations³⁵ or colour preferences,³⁶ although other possibilities exist. For example, researchers have studied affective colour metaphors,³⁷ colour and mood relationships,³⁸ colour and affect expressed through music,³⁹ and the impact of coloured environments on emotions.⁴⁰ When conducting such studies, researchers either physically show colours⁴¹ or tap into the linguistic

³⁵ JONAUSKAITE *et al.* (2019d); ADAMS / OSGOOD (1973); VALDEZ / MEHRABIAN (1994); HUPKA *et al.* (1997).

³⁶ TAYLOR / CLIFFORD / FRANKLIN (2013); PALMER / SCHLOSS (2010); HURLBERT / LING (2007); JONAUSKAITE *et al.* (2019c).

³⁷ ALLAN (2009).

³⁸ JONAUSKAITE *et al.* (2019b).

³⁹ PALMER *et al.* (2013).

⁴⁰ COSTA *et al.* (2018).

⁴¹ VALDEZ / MEHRABIAN (1994); HEMPHILL (1996).

representation of colours by presenting colour terms.⁴² Tasks to assess colour-affect relationships can also vary widely. Participants may be asked to select a physical colour for a given affective term,⁴³ or to select or rate affective terms for a given physical colour⁴⁴ or colour term.⁴⁵ Likewise, participants may have to produce a colour that fits particular emotions expressed through the body,⁴⁶ or colour in affective drawings.⁴⁷ This diversity in research questions and methodologies make the findings difficult to synthesise and interpret.

Nevertheless, in looking beyond the multitude of methodological approaches, we may yet advance some conclusions that display some systematic and consistent colour-affect relationships. One conclusion is that lighter colours are evaluated more positively while darker colours are evaluated more negatively.⁴⁸ This association between lightness and positivity has been hypothesised to be universal,⁴⁹ and indeed already existed in antiquity (Grand-Clément and Sassi in this volume). Another widely observed relationship is the association between yellow and joy.⁵⁰ However, despite its ubiquitous presence, yellow-joy relationships are subject to cultural-regional influences. Our recent study demonstrated that the likelihood of associating joy with yellow was more strongly expressed by people who lived in colder and rainier climates.⁵¹ Moreover, it is important to note that not all yellows are perceived as equally joyful, particularly

⁴² ADAMS / OSGOOD (1973); JONAUSKAITE *et al.* (2019d); SUTTON / ALTARRIBA (2016).

⁴³ D'ANDRADE / EGAN (1974).

⁴⁴ VALDEZ / MEHRABIAN (1994).

⁴⁵ ADAMS / OSGOOD (1973); HUPKA *et al.* (1997).

⁴⁶ DAEL *et al.* (2016).

⁴⁷ BURKITT / BARRETT / DAVIS (2003).

⁴⁸ SPECKER *et al.* (2018); MEIER *et al.* (2007); ALLAN (2009); LAKENS *et al.* (2013); VALDEZ / MEHRABIAN (1994).

⁴⁹ SPECKER *et al.* (2018).

⁵⁰ BURKITT / SHEPPARD (2014); LINDBORG / FRIBERG (2015); DAEL *et al.* (2016); SUTTON / ALTARRIBA (2016); JONAUSKAITE *et al.* (2019b); KAYA / EPPS (2004).

⁵¹ JONAUSKAITE *et al.* (2019a).

not the yellows of dark or greyish varieties.⁵² Thus, it is crucial to take saturation and lightness into account when studying affective meaning of yellow (see 1. **Colour**). There are also some regularities in colour preferences. For instance, the colour blue is generally liked, while the colour brown (i.e., dark shades of yellow and orange) is disliked.⁵³ However, while these preferences are apparent in many industrialised countries, they may be less apparent in people from non-industrialised small-scale societies.⁵⁴ In the field of psychology, we often lack knowledge from less-frequently-studied populations, while populations of Western undergraduate psychology students are oversampled.⁵⁵ Thus, we do not know to what extent we may generalise results across time and space. Finally, many research studies have exclusively focused on red, finding that this colour directly influences human psychological functioning.⁵⁶ For instance, red seems to enhance chances of winning in some sports and also enhances perceived attractiveness of a potential partner. It seems that red symbolises powerful affective states. These signals can either invite to *approach* or to *avoid* situations. One would approach an attractive partner dressed in red, while one would avoid the same colour in venomous animals and other indicators where it is associated with signalling danger. In both cases, the bearer of the red signals some power. This use of colour to signal power and status on worldly or spiritual matters is far from new, and is widely cited in antiquity (Grand-Clément, Wharton, Jockey in this volume).

When assessing colour-affect associations that are universal and/or shaped by cultural-regional differences, we do not explain their origin. Rather, we describe their existence. A notable exception is the Ecological Valence Theory of colour preferences.⁵⁷

⁵² SCHLOSS / WITZEL / LAI (2020).

⁵³ PALMER / SCHLOSS (2010); EYSENCK (1941); JONAUSKAITE *et al.* (2016).

⁵⁴ TAYLOR / CLIFFORD / FRANKLIN (2013); GROYECKA *et al.* (2019).

⁵⁵ HENRICH *et al.* (2010).

⁵⁶ ELLIOT / MAIER (2014).

⁵⁷ PALMER / SCHLOSS (2010).

This theory has been published in 2010, and well received by the scientific community.⁵⁸ This theory aims to explain colour preferences through underlying affective associations. According to the Ecological Valence Theory, people like certain colours because these colours are associated with positive objects or experiences of the same colour. To exemplify this idea, people like blue because blue reminds them of a clear sky or clean water. Likewise, people like green because green reminds them of lush vegetation or fertile crops. At the same time, people might dislike certain colours because these colours are associated with negative objects or experiences with the same colour. For instance, people dislike brown because it might remind them of faeces. They might also dislike green because it reminds them of broccoli they never enjoyed eating. Subsequent studies have supported this theory, at least in the short term. The colour red was liked i) more strongly after participants saw many positive red images (e.g., berries) and ii) less strongly after participants saw many negative red images (e.g., blood).⁵⁹ Similarly, people living in four-season climates on the Northern hemisphere liked brownish-yellowish colours to a greater extent in autumn than in other seasons, when these colours are more frequent in their environment.⁶⁰ Such theoretical suggestions are not new, rather they are reminiscent of suggestions communicated in the current collection (Cagnoli Fieconi and Sassi in this volume).

Thanks to such comprehensive studies, we can begin to establish which colour-affect associations are likely to be universal versus those that are shaped by our direct cultural, environmental, or linguistic experiences. Moreover, we consider it key to acquire more comprehensive baseline data, namely what are the colour-emotion associations for many colours and many emotions, at different ages, and in as many nations as we can sample. In our research domain, this aim is often considered

⁵⁸ Google Scholar shows 433 citations by 20/04/2020.

⁵⁹ STRAUSS / SCHLOSS / PALMER (2013).

⁶⁰ SCHLOSS / HECK (2017).

unambitious, because no theory-based question is being targeted. However, we argue that these baseline data are needed before advancing on a theoretical level. Our first large-scale project focuses on colour-emotion associations, presenting colour terms, and starting to also use colour patches. Currently, we are working with basic colour terms and focal colours. Moreover, we are studying 20 different specific emotions using a validated tool named the Geneva Emotion Wheel (GEW; see Fig. 9.2⁶¹). GEW allows us to collect associations with specific emotions, which can easily be grouped according to the affective dimensions of valence, arousal, and power. We are aiming for data from as wide a sample population as possible, targeting many nations and across a large age range.⁶² Finally, we work alongside local collaborators who have knowledge of indigenous language(s) and cultural customs, and this partnership is key for any meaningful interpretation of such results.

We have begun to share the first multi-national results on the associations between colour terms and emotion terms. The first study showed some consistent colour-emotion associations, present in all our studied nations (i.e., Germany, UK, Greece, and China), despite the wide cultural diversity between these nations.⁶³ Consistent associations included red-love, red-anger, yellow-joy, black-fear, and brown-disgust. In addition, we observed several nation-specific associations, which were determined using machine-learning algorithms. These algorithms allowed us to identify the participants' origin nation. The identification was better than chance level (i.e., better than guessing). An example of such nation-specific associations was the link between purple and sadness. While the majority of Greek participants associated purple exclusively with sadness, participants from other countries were less decisive about the emotional meaning of purple and chose diverse positive and negative associations. In our follow-up

⁶¹ SCHERER (2005); SCHERER *et al.* (2013).

⁶² MOHR *et al.* (2018).

⁶³ JONAUSKAITE *et al.* (2019d).

study, we analysed colour-emotion associations in 30 nations,⁶⁴ observing a high degree of similarity in the pattern of colour-emotion associations (i.e., which colours were associated with which emotions).

To enrich the current chapter with contemporary colour-emotion associations from geographical regions of interest, we present results for modern Greece, Italy, and Turkey (Fig. 9.2). As demonstrated in our results and in Fig. 9.2, there is a high — although not complete — degree of universality in colour-emotion associations, which may indicate an evolutionary origin of colour-emotion associations (e.g., blood is always red, thus red signals powerful negative emotions like anger or hate). Other previous studies have also reported cross-cultural similarities⁶⁵ and have noticed differences.⁶⁶ Our own work on 30 nations further indicates that linguistic and geographical proximity plays an important role in colour-emotion associations. Participants who came from neighbouring countries or those who spoke the same language were even more likely to associate similar emotions with colour terms. Hence, affective meaning of colour has some universal features that are further shaped by linguistic, cultural, and geographic environments.

In all of these studies, we worked with colour terms. While a linguist or a historian might have no issue in working with such colour terms, other researchers may consider colour to be a primarily visual experience. In this regard, it would always be important to know whether affective associations are comparable when people see colour terms or patches. We have recently shown that this is the case for two different groups of Swiss participants, observing a high similarity in emotion associations with colour terms and colour patches.⁶⁷ For instance, joy was associated with yellow and orange, irrespective of whether these colours were seen as perceptual stimuli or as words. Participants also associated red

⁶⁴ JONAUSKAITE *et al.* (forthcoming).

⁶⁵ ADAMS / OSGOOD (1973); SPECKER *et al.* (2018).

⁶⁶ HUPKA *et al.* (1997); MADDEN / HEWETT / ROTH (2000).

⁶⁷ JONAUSKAITE *et al.* (2020).

with love and anger, brown with disgust, and black with a wide range of negative emotions. We only detected a difference between emotion associations with colour terms and colour patches for black and purple. For black, we observed a larger number of negative emotion associations when black was presented as a term than as a patch. For purple, there was low agreement in which emotions were associated with purple, regardless of whether it was a term or a patch. According to this study, emotion associations seem to be independent from how colour is presented.

We would like to close this section with a final note. Empirical studies that show relationships between colour and affect do not demonstrate that exposure to colour impacts us affectively. So far, there are few systematic investigations on changes in affective states with colour exposure.⁶⁸ We have begun generating evidence for this understudied field by testing whether particular mood states have signature colours. Participants underwent a mood induction procedure before reporting which colour would best represent how they feel. Joy was systematically associated with yellow, while negative moods — fear or sadness —, were systematically associated with dark colours.⁶⁹ Relaxation was not associated with a particular hue, but it was more often paired with yellow-green hues than other mood states. Now, if one would like to know whether exposure to colour impacts us affectively, our results on mood states may be instructive. For instance, one could perform a study in which participants are immersed into environmental colours that we found to be associated with joy (saturated yellow) or sadness (saturated grey). If the relationship between affective state to colour also holds for colour to affective state, people immersed in a yellow environment should exhibit a more positive mood than those immersed in a grey environment. Moreover, for such causal observations to be truly meaningful, they should hold beyond a short laboratory testing session.

⁶⁸ VON CASTELL *et al.* (2018); COSTA *et al.* (2018).

⁶⁹ JONAUSKAITE *et al.* (2019b).

4. Conclusion

The aim of this chapter was to convey how contemporary psychologists approach research on colour and affect, and what challenges arise when studying either entity as well as relationships between them. We have also summarised some observations of our ongoing research on the universalities of colour-affect associations, while accounting for the definitions of affect and colour presentation modes, or colour words versus actual colours. As researchers studying contemporary phenomena, we can systemise study questions, control data collection, and directly or indirectly inquire about colour-affect relationships. Such possibilities in research control are not available to scholars who wish to understand similar relationships in ancient times. However, we highlight that results from contemporary studies are frequently correlated with what has been reported for colour and colour-affect relationships in ancient times. Thus, our contemporary approaches can contribute to the study of universal psychological phenomena on a diachronic and multiregional or multicultural scale. This observation — that findings may very well match across space, time, and disciplines — yields important potential for multidisciplinary conversations and enhanced collective understanding moving forward.

Works cited

- ADAMS, F.M. / OSGOOD, C.E. (1973), “A Cross-Cultural Study of the Affective Meanings of Color”, *J Cross Cult Psychol* 4, 135-157. <<https://doi.org/10.1177/002202217300400201>>.
- ALLAN, K. (2009), “The Connotations of English Colour Terms: Colour-Based X-Phemisms”, *J Pragmat* 41, 626-637. <<https://doi.org/10.1016/j.pragma.2008.06.004>>.
- BERLIN, B. / KAY, P. (1969), *Basic Color Terms. Their Universality and Evolution* (Berkeley).
- BIGGAM, C.P. (2010), “The Development of the Basic Colour Terms of English”, in A. HALL *et al.* (eds.), *Interfaces between Language and Culture in Medieval England. A Festschrift for Matti Kilpiö* (Leiden), 231-266.

- (2012a), “Synchronic Studies”, in EAD., *The Semantics of Colour. A Historical Approach* (Cambridge), 127-151.
- (2012b), “Prehistoric Colour Studies”, in EAD., *The Semantics of Colour. A Historical Approach* (Cambridge), 169-192.
- BIMLER, D. / UUSKÜLA, M. (2018), “Individual Variations in Color-Concept Space Replicate across Languages”, *J Opt Soc Am A* 35, B184. <<https://doi.org/10.1364/JOSAA.35.00B184>>.
- BRADLEY, M. (2009), *Colour and Meaning in Ancient Rome* (Cambridge).
- (2014), “Colour as Synaesthetic Experience in Antiquity”, in S. BUTLER / A. PURVES (eds.), *Synaesthesia and the Ancient Senses* (London), 135-148.
- BRADLEY, M. / LANG, P.P.J. (1999), “Affective Norms for English Words (ANEW): Instruction Manual and Affective Ratings”, *Psychology Technical*. <<https://doi.org/10.1109/MIC.2008.114>>.
- BURKITT, E. / BARRETT, M. / DAVIS, A. (2003), “Children’s Colour Choices for Completing Drawings of Affectively Characterised Topics”, *J Child Psychol Psychiatry Allied Discip* 44, 445-455. <<https://doi.org/10.1111/1469-7610.00134>>.
- BURKITT, E. / SHEPPARD, L. (2014), “Children’s Colour Use to Portray Themselves and Others with Happy, Sad and Mixed Emotion”, *Educ Psychol* 34, 231-251. <<https://doi.org/10.1080/01443410.2013.785059>>.
- CASSON, R.W. (1994), “Russett, Rose, and Raspberry: The Development of English Secondary Color Terms”, *J Linguist Anthropol* 4, 5-22. <<https://doi.org/10.1525/jlin.1994.4.1.5>>.
- CASTELL, C. VON *et al.* (2018), “Cognitive Performance and Emotion Are Indifferent to Ambient Color”, *Color Res Appl* 43, 65-74. <<https://doi.org/10.1002/col.22168>>.
- CONKLIN, H.C. (1986), “Hanunóo Color Categories”, *J Anthropol Res* 42, 441-446.
- COSTA, M. *et al.* (2018), “Interior Color and Psychological Functioning in a University Residence Hall”, *Front Psychol* 9, 1-13. <<https://doi.org/10.3389/fpsyg.2018.01580>>.
- D’ANDRADE, R. / EGAN, M. (1974), “The Colors of Emotion”, *American Ethnologist* 1, 49-63. <<https://doi.org/10.1525/ae.1974.1.1.02a00030>>.
- DAEL, N. *et al.* (2016), “Put on That Colour, It Fits Your Emotion: Colour Appropriateness as a Function of Expressed Emotion”, *Q J Exp Psychol* 69, 1619-1630. <<https://doi.org/10.1080/17470218.2015.1090462>>.
- DAVIDSON, R.J. / SCHERER, K.R. / GOLDSMITH, H.H. (2003), *Handbook of Affective Sciences* (Oxford).

- ELLIOT, A.J. / MAIER, M.A. (2014), "Color Psychology: Effects of Perceiving Color on Psychological Functioning in Humans", *Annu Rev Psychol* 65, 95-120. <<https://doi.org/10.1146/annurev-psych-010213-115035>>.
- EYSENCK, H.J. (1941), "A Critical and Experimental Study of Colour Preferences", *Am J Psychol* 54, 385-394. <<https://doi.org/10.2307/1417683>>.
- FONTAINE, J.R.J. *et al.* (2007), "The World of Emotions is Not Two-Dimensional", *Psychol Sci* 18, 1050-1057. <<https://doi.org/10.1111/j.1467-9280.2007.02024.x>>.
- GEGENFURTNER, K.R. / ENNIS, R. (2016), "Fundamentals of Color Vision. II, Higher-Order Color Processing", in A.J. ELLIOT / M.D. FAIRCHILD / A. FRANKLIN (eds.), *Handbook of Color Psychology* (Cambridge), 70-109.
- GROYECKA, A. *et al.* (2019), "Similarities in Color Preferences between Women and Men: The Case of Hadza, the Hunter-gatherers from Tanzania", *Perception* 48, 428-436. <<https://doi.org/10.1177/0301006619840937>>.
- HEMPHILL, M. (1996), "A Note on Adults' Color-Emotion Associations", *J Genet Psychol* 157, 275-280. <<https://doi.org/10.1080/00221325.1996.9914865>>.
- HENRICH, J. / HEINE, S.J. / NORENZAYAN, A. (2010), "The Weirdest People in the World?", *Behav Brain Sci* 33, 61-83. <<https://doi.org/10.1017/S0140525X0999152X>>.
- HUNT, R.W.G. / POINTER, M.R. (2011), "Colour Order Systems", in EID., *Measuring Colour* (Chichester), 155-195.
- HUPKA, R.B. *et al.* (1997), "The Colors of Anger, Envy, Fear, and Jealousy", *J Cross Cult Psychol* 28, 156-171. <<https://doi.org/10.1177/0022022197282002>>.
- HURLBERT, A.C. / LING, Y. (2007), "Biological Components of Sex Differences in Color Preference", *Curr Biol* 17, 623-625. <<https://doi.org/10.1016/j.cub.2007.06.022>>.
- IRWIN, E. (1974), *Colour Terms in Greek Poetry* (Toronto).
- ITKES, O. / KRON, A. (2019), "Affective and Semantic Representations of Valence: A Conceptual Framework", *Emot Rev* 11, 283-293. <<https://doi.org/10.1177/1754073919868759>>.
- JOCKEY, P. (2015), *Le mythe de la Grèce blanche. Histoire d'un rêve occidental* (Paris).
- JONAUSKAITE, D. *et al.* (2016), "Most and Least Preferred Colours Differ According to Object Context: New Insights from an Unrestricted Colour Range", *PLoS One* 11, 1-22. <<https://doi.org/10.1371/journal.pone.0152194>>.

- *et al.* (2019a), “The Sun Is no Fun without Rain: Physical Environments Affect How We Feel about Yellow across 55 Countries”, *J Environ Psychol* 66, 101350. <<https://doi.org/10.1016/j.jenvp.2019.101350>>.
- *et al.* (2019b), “What Color Do You Feel? Color Choices Are Driven by Mood”, *Color Res Appl* 44, 272-284. <<https://doi.org/10.1002/col.22327>>.
- *et al.* (2019c), “Pink for Girls, Red for Boys, and Blue for Both Genders: Colour Preferences in Children and Adults”, *Sex Roles* 80, 630-642. <<https://doi.org/10.1007/s11199-018-0955-z>>.
- *et al.* (2019d), “A Machine Learning Approach to Quantify the Specificity of Colour-Emotion Associations and their Cultural Differences”, *R Soc Open Sci* 6, 190741. <<https://doi.org/10.1098/rsos.190741>>.
- *et al.* (2020), “Feeling Blue or Seeing Red? Similar Pattern of Emotion Associations with Colour Patches and Colour Terms”, *i-Perception* 11, 1-24. <<https://doi.org/10.1177/2041669520902484>>.
- *et al.* (forthcoming), “Universal Patterns in Color-emotion Associations Are Further Shaped by Linguistic and Geographic Proximity”, *Psychological Science*.
- KAYA, N. / EPPS, H.H. (2004), “Relationship between Color and Emotion: A Study of College Students”, *Coll Stud J* 38, 396-406.
- LAKENS, D. *et al.* (2013), “Brightness Differences Influence the Evaluation of Affective Pictures”, *Cogn Emot* 27, 1225-1246. <<https://doi.org/10.1080/02699931.2013.781501>>.
- LINDBORG, P. / FRIBERG, A.K. (2015), “Colour Association with Music Is Mediated by Emotion: Evidence from an Experiment Using a CIE Lab Interface and Interviews”, *PLoS One* 10, e0144013. <<https://doi.org/10.1371/journal.pone.0144013>>.
- LINDSEY, D.T. / BROWN, A.M. (2014), “The Color Lexicon of American English”, *J Vis* 14, 17. <<https://doi.org/10.1167/14.2.17>>.
- LYONS, J. (1999), “The Vocabulary of Color with Particular Reference to Ancient Greek and Classical Latin”, in A. BORG (ed.), *The Language of Color in the Mediterranean. An Anthology on Linguistic and Ethnographic Aspects of Color Terms* (Stockholm), 38-75.
- MADDEN, T.J. / HEWETT, K. / ROTH, M.S. (2000), “Managing Images in Different Cultures: A Cross-National Study of Color Meanings and Preferences”, *J Int Mark* 8, 90-107. <<https://doi.org/10.1509/jimk.8.4.90.19795>>.
- MEIER, B.P. *et al.* (2007), “When ‘Light’ and ‘Dark’ Thoughts Become Light and Dark Responses: Affect Biases Brightness Judgments”, *Emotion* 7, 366-376. <<https://doi.org/10.1037/1528-3542.7.2.366>>.

- MOHR, C. *et al.* (2018), "Unifying Research on Colour and Emotion: Time for a Cross-Cultural Survey on Emotion Associations with Colour Terms", in L.W. MACDONALD / C.P. BIGGAM / G.V. PARAMEI (eds.), *Progress in Colour Studies. Cognition, Language, and Beyond* (Amsterdam), 209-222.
- MUNSELL, A.H. (1912), "A Pigment Color System and Notation", *Am J Psychol* 23, 236-244.
- PALMER, S.E. *et al.* (2013), "Music-Color Associations Are Mediated by Emotion", *Proc Natl Acad Sci* 110, 8836-8841. <<https://doi.org/10.1073/pnas.1212562110>>.
- PALMER, S.E. / SCHLOSS, K.B. (2010), "An Ecological Valence Theory of Human Color Preference", *Proc Natl Acad Sci* 107, 8877-8882. <<https://doi.org/10.1073/pnas.0906172107>>.
- PARAMEI, G.V. (2005), "Singing the Russian Blues: An Argument for Culturally Basic Color Terms", *Cross-Cultural Res* 39, 10-38. <<https://doi.org/10.1177/1069397104267888>>.
- PARRAGA, C.A. / AKBARINIA, A. (2016), "NICE: A Computational Solution to Close the Gap from Colour Perception to Colour Categorization", *PLoS One* 11, e0149538. <<https://doi.org/10.1371/journal.pone.0149538>>.
- REGIER, T. / KAY, P. / COOK, R.S. (2005), "Focal Colors Are Universal after All", *Proc Natl Acad Sci* 102, 8386-8391. <<https://doi.org/10.1073/pnas.0503281102>>.
- SCHERER, K.R. (2005), "What Are Emotions? And How Can They Be Measured?", *Soc Sci Inf* 44, 695-729. <<https://doi.org/10.1177/0539018405058216>>.
- *et al.* (2013), "The GRID Meets the Wheel: Assessing Emotional Feeling via Self-Report", in J.R.J. FONTAINE / K.R. SCHERER / C. SORIANO (eds.), *Components of Emotional Meaning. A Sourcebook* (Oxford), 281-298.
- SCHLOSS, K.B. / HECK, I.A. (2017), "Seasonal Changes in Color Preferences Are Linked to Variations in Environmental Colors: A Longitudinal Study of Fall", *i-Perception* 8, 1-19. <<https://doi.org/10.1177/2041669517742177>>.
- SCHLOSS, K.B. / WITZEL, C. / LAI, L.Y. (2020), "Blue Don't Bring the Blues: Questioning Conventional Notions of Color-Emotion Associations", *J Opt Soc Am A*. 37, 813-824. <<https://doi.org/10.1364/josaa.383588>>.
- SPECKER, E. *et al.* (2018), "The Universal and Automatic Association between Brightness and Positivity", *Acta Psychol* (Amst) 186, 47-53. <<https://doi.org/10.1016/j.actpsy.2018.04.007>>.
- STOCKMAN, A. / BRAINARD, D.H. (2015), "Fundamentals of Color Vision I: Color Processing in the Eye", in A.J. ELLIOT /

- M.D. FAIRCHILD / A. FRANKLIN (eds.), *Handbook of Color Psychology* (Cambridge), 27-69.
- STRAUSS, E.D. / SCHLOSS, K.B. / PALMER, S.E. (2013), "Color Preferences Change after Experience with Liked/Disliked Colored Objects", *Psychon Bull Rev* 20, 935-943. <<https://doi.org/10.3758/s13423-013-0423-2>>.
- STURGES, J. / WHITFIELD, T.W.A. (1995), "Locating Basic Colours in the Munsell Space", *Color Res Appl* 20:364-376. <https://doi.org/10.1002/col.5080200605>
- SUTTON, T.M. / ALTARRIBA, J. (2016), "Color Associations to Emotion and Emotion-Laden Words: A Collection of Norms for Stimulus Construction and Selection", *Behav Res Methods* 48, 686-728. <<https://doi.org/10.3758/s13428-015-0598-8>>.
- TAYLOR, C. / CLIFFORD, A. / FRANKLIN, A. (2013), "Color Preferences Are Not Universal", *J Exp Psychol Gen* 142, 1015-1027. <<https://doi.org/10.1037/a0030273>>.
- UUSKÜLA, M. / BIMLER, D. (2016a), "From Listing Data to Semantic Maps: Cross-Linguistic Commonalities in Cognitive Representation of Color", *Folk Electron J Folk* 64, 57-90.
- (2016b) "How Universal Are Focal Colors after All? A New Methodology for Identifying Focal Color Terms", in G. PAULSEN / M. UUSKÜLA / J. BRINDLE (eds.), *Color Language and Color Categorization* (Newcastle upon Tyne), 2-39.
- VALDEZ, P. / MEHRABIAN, A. (1994), "Effects of Color on Emotions", *J Exp Psychol Gen* 123, 394-409. <<https://doi.org/10.1037/0096-3445.123.4.394>>.
- WHARTON, D. (2016), "Abstract and Embodied Colors in Pliny the Elder's *Natural History*", in W.M. SHORT (ed.), *Embodiment in Latin Semantics* (Amsterdam), 177-208.
- WILMS, L. / OBERFELD, D. (2018), "Color and Emotion: Effects of Hue, Saturation, and Brightness", *Psychol Res* 82, 896-914. <<https://doi.org/10.1007/s00426-017-0880-8>>.