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Color perception and taste for abstract paintings

Perception des couleurs et goût des peintures abstraites

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ABSTRACT. This article raises the fundamental questions whether all humans are experiencing the same color and taste. Color perception is significantly impacted when the eye loses capability to discriminate color gradients that lead to a shift to more gray and yellow. Cognitive differences are observed between men and women for the perception of color because women can differentiate more shades of colors than males and they have also a wider color spectrum than men. However the complexity in judgment on color is primarily based on the educational level of a viewer and his experience in visual perception. The evaluation of color and taste therefore is subjective and is based almost entirely on personal experience. There is not a single satisfactory answer to the question of whether a particular color and taste is the right one or not, or why we interpret color differently.

RÉSUMÉ. Cet article soulève la question fondamentale de savoir si tous les êtres humains perçoivent les couleurs et les goûts de la même manière. La perception des couleurs est fortement altérée lorsque l'œil perd sa capacité à distinguer les dégradés de couleurs, ce qui entraîne une tendance vers le gris et le jaune. Des différences cognitives sont observées entre les hommes et les femmes quant à la perception des couleurs : les femmes peuvent distinguer davantage de nuances et possèdent un spectre de couleurs plus étendu. Cependant, la complexité du jugement des couleurs repose principalement sur le niveau d'instruction et l'expérience visuelle de l'observateur. L'évaluation des couleurs et des goûts est donc subjective et repose presque entièrement sur l'expérience personnelle. Il n'existe pas de réponse unique et satisfaisante à la question de savoir si une couleur ou un goût particulier est approprié ou non, ni pourquoi nous interprétons les couleurs différemment.

KEYWORDS. Abstract painting, color perception, cognitive differences, color judgment.

MOTS-CLÉS. Peinture abstraite, perception des couleurs, différences cognitives, jugement des couleurs.

1.Introduction

An old saying refers to an assertion that there is no arguing about taste and color, and this claim is widespread in various societies. Basically it means that there is no necessity to debate, because no dispute would lead to a judgment on the level of taste and color. The problem in establishing an evaluation on taste and color is to develop appropriate arguments on what actually is required to determine on a quantitative scale if a certain taste is the right one. Hindrance to elaborate on such measure is that a judgment would be based on personal experience in aesthetics and social upbringing that would complicate the setting for a universal standard. Thus an individual evaluating on taste and color will certainly call for a dispute with individuals or groups, and may generate conflicts between the parties involved. Furthermore, differences in educational level and discipline orientation may impact benchmarking for a possible ranking of taste and color. This task also raises the question if varying educational and ethnic backgrounds play a role in perception of abstract paintings and if everybody perceives colors the same way equally.

Before abstract painting was fully integrated into our present culture, the reigning class in previous societies set norms for the styles and subjects of art, and consequently it restrained artists' imagination and set limits to their deliberation. The departure from this intellectual barrier was possible by introducing concepts that set priorities on the use of lines, shapes, colors and forms and abolished the classical representation of natural scenes and events (Art Rewards, 2025). This approach gave more freedom to the artists, and the deviation from reality allowed them to diverge from the conduct of

classical painting. However, the new phase also addressed a new audience that had to overcome interferences by those who objected to the new appearance in art. Irrelevant judgments on what is good and what is bad led to more confusion, because artists continued to look for more freedom and experimented without limit or constraint.

The discrepancy between artists and the audience became more intricate due to the interaction with and support by the scientific development and access to new resources and techniques that could be integrated into artistic expressions. This further complicated the evaluation of modern abstract art, because it required a more sophisticated education on the reviewer's part. It has been demonstrated that the comprehension of abstraction and complexity of paintings depends on recognition capabilities and extent of art education, and persons with training in art may even distinguish between levels of abstraction and visual complexity of paintings (Freedman, 1988).

In the past, a few centuries ago, it was possible to master scientific skills and art equally. For instance, Leonardo da Vinci during the High Renaissance was a leading painter, but he was also a scientist and dealt with anatomy, astronomy, botany, cartography, paleontology and engineering (Pomerol and Popis 2026). However, from his time, science advanced to new levels of materials and techniques that expanded the artist's range of tools, but it also set limits to get actively involved in the very discipline-oriented science as of today. Despite this short coming, the benefits of progress in science had a feedback to art as outlined in Figure 1 that shows the general information flow in science and technology with the feedback into art.

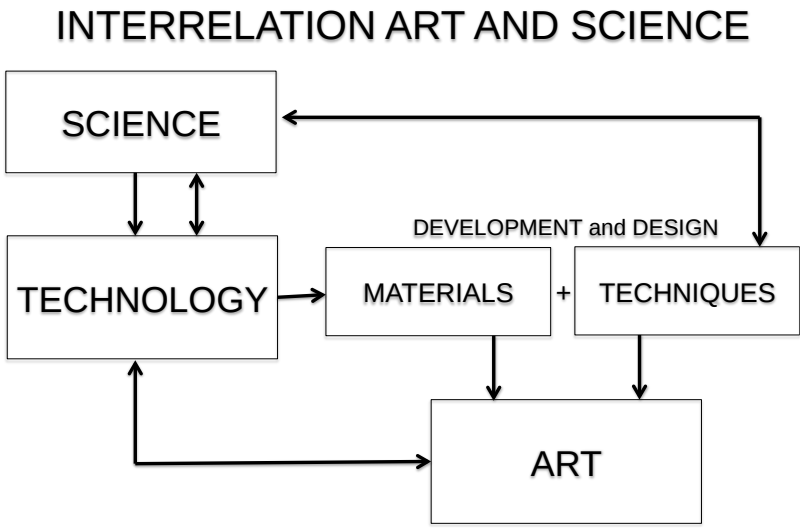

Figure 1. *General information flows in science technology with feedback to art.*

Still, a close relationship between art and science is not yet fully recognized in our society and its educational institutions, although many universities have departments that merge in their programs art and sciences. However, at present, mergers of art, science and technology are especially seen in the commercial and public service sectors where presentations are commonly enhanced by artistic design and color annotations. On the other side, certain art principles are used to enhance scientific information especially in data displays of which two examples are shown in Figure 2. Figure 2A shows two images that have the same image content, but Figure 2A is displayed in a black and white scale, whereas Figure 2B has a color annotation that makes it easier to recognize features that may go unnoticed by an unskilled interpreter and also has a more aesthetic appearance. The remarquable point is that the Figure 2A in black-and-white reveals for a skilled image interpreter the same content and structures as seen in the color coded Figure 2B. Such color-coding is also applied in daily information flow, for instance in weather maps, and Figure 2C gives an example of temperature data display where specific colors are annotated to mark regions with the same temperature.

Against this background, the question arises whether observation and evaluation of abstract paintings can be uniformly generalized and whether certain criteria can be systematically applied to qualitatively assess taste and color. In order to address this matter, the following elaborates on some criteria that may illustrate the difficulties of this undertaking, but it should be noted that this task is by no means exhaustive although it may provide some concepts for further considerations.

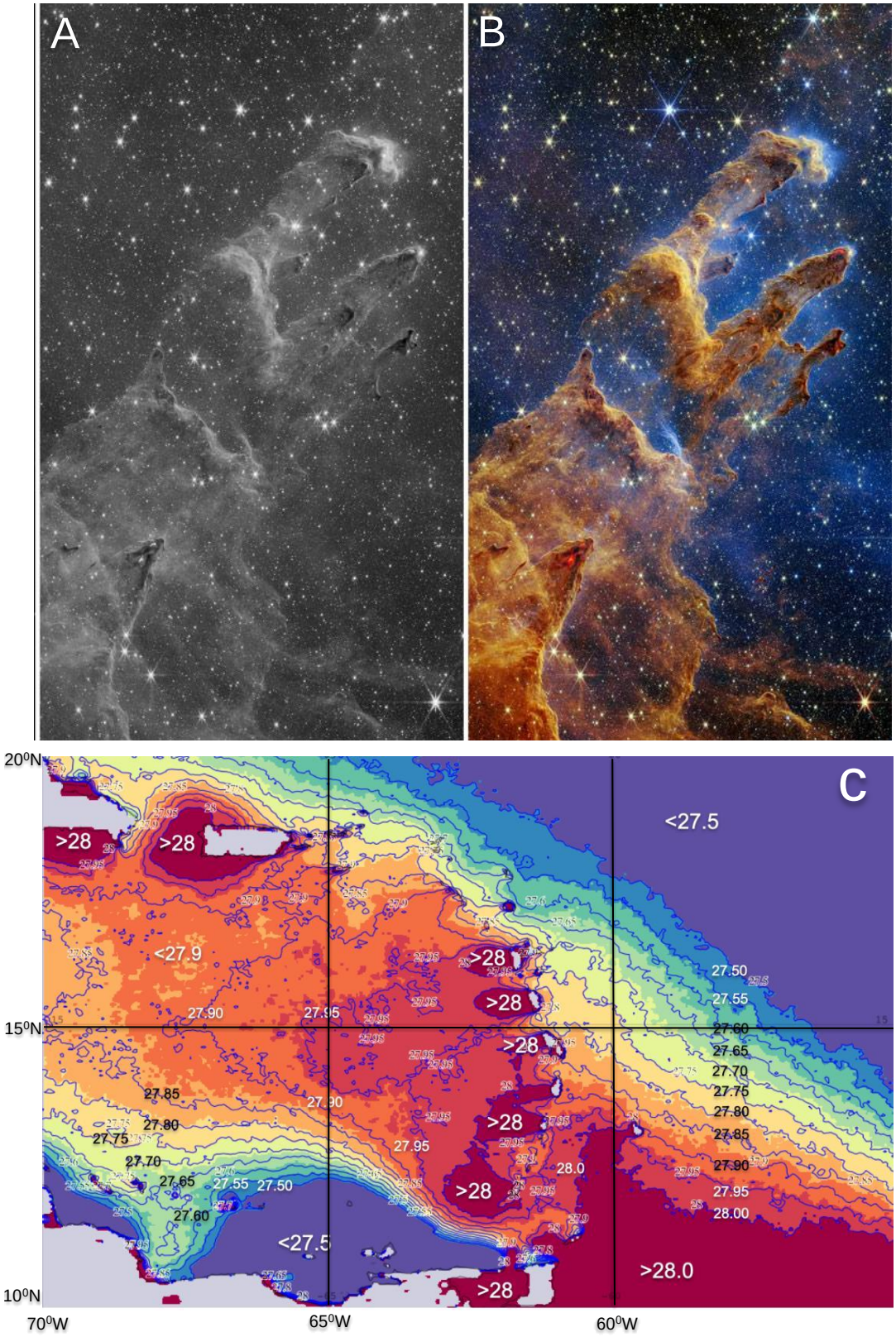

Figure 2. *A: Image perception of black-and-white image images. Figure 2B is the same as the one shown in Figure 2A, but the grey-scale has been color-coded. Source: NASA Webb's near-infrared image of the Pillars of Creation. Figure 2C shows the color- coding of a temperature map.*

2. Color perception through the human eye

The comprehension of abstract art is very complex and its evaluation is based on many characteristics that contribute to a decision whether a work of art appeals either with positive or negative feedback. Judgment of art is mainly based on perceived color schemes and on physiological factors. Fundamental questions however arise if every human sees the same color and texture and how much education plays a role in the decision process to evaluate art. Many other factors play a role in judging abstract art, but only a few that seem to have possible impact on a decision making process that will be highlighted in the following with the inclusion of some basic principles of visual perception. Basically, perceiving a picture is based on the physical properties of light at different wavelengths that is either absorbed or reflected from a scene and is identified by the brain as various colors. However, our vision is rather limited, because only a small range of the perceived light from the electromagnetic spectrum (EMS) that is emitted from a light source is recognized by the human eye, and it ranges only from about 0.38 to 0.74µm as shown in Figure 3.

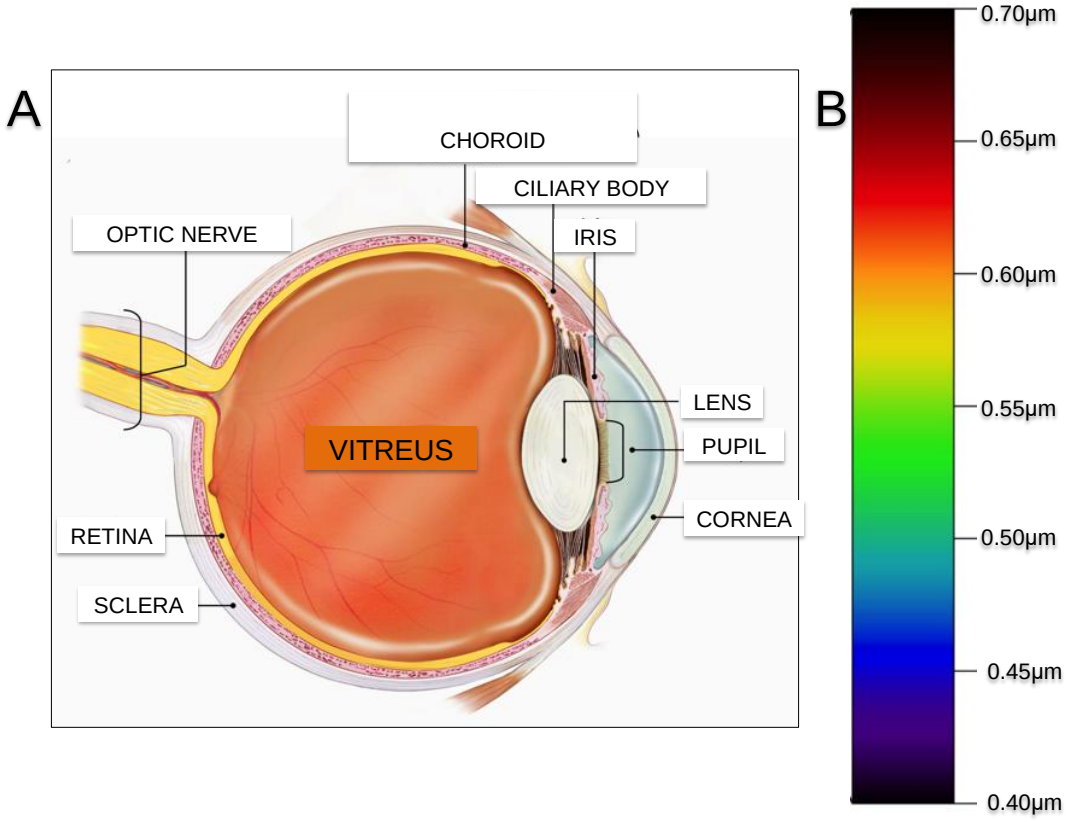

Figure 3. *A: Schematic of the human eye: B: The narrow band of the electromagnetic spectrum in the visible. Narrow spectral bands are recognized in specific spectral regions as color: red at 0.625–0.740 µm, orange at 0.590–0.625 µm, yellow, at 0.565–0.590 µm, green at 0.500–0.565 µm, cyan at 0.485–0.500 µm, blue at 0.450–0.485 µm and violet at 0.380–0.450 µm.*

Figure 3A shows that light first enters a flexible lens that focuses light onto the retina for near or far objects where light is converted into electrical signals that are carried through the optic nerve to the brain, which interprets them as a perceived color. This shows that changes in the human optical system may also result in a different color perception by individuals and that they may see the same image differently. This discrepancy is remarkably enhanced by general degeneration of the eyes as witnessed in persons with cataracts. Color vision is significantly reduced when cataracts are building in the eyes and colors loose brightness, and it is difficult to discriminate color gradients. This shortcoming in reduced color recognition is due a shift in wavelength recognition that causes colors to appear to a person with cataracts as faded colors that are dull or less vibrant, with a distinct shift toward yellow or brown tones. Especially, blue and purple become more difficult to distinguish, appearing as muted or gray, while white may shift to yellow or brown. A simulation how cataracts may produce possible

optical changes in color perception by viewing of an abstract painting is shown in Figure 4.1, and Figure 4.2.

The spectral perception of artwork, especially abstract paintings, can be modified by exposure to different illumination. For instance, when objects with the same color are exposed to different light conditions they may change their reflective properties according to their surface conditions. Another phenomenon known as metamerism, is the process where two colors, though physically different, appear identical under one light source but different under another (Rafizadeh, 2015). This shows that changes in the human optical system may also result in a different color perception by individuals, and they may see the same image differently. It also has been pointed out by Lafer-Sousa et al. (2015) that some people may perceive selective colors according to the wavelength of a viewed scene. Furthermore, the perception of beauty in abstract paintings seems to be a function of exposure time to artwork, and it correlates with particular image properties. For instance, when abstract paintings were rated after long exposure to the viewer, the degree of beauty decreased after exposure to paintings that were originally rated as beautiful (Mallon et al. 2014). It shows that appreciation of artworks increases with exposure time of art to the viewer that was also recognized by Böthig and Hayn-Leichsenring (2017).

Figure 4. *4.1. Original painting, 4.2. Simulated color perception when contrast, tint and sharpness are reduced from the reflection of the painting in 4.1.*

The perception of the human eye can also be manipulated by vision techniques that simulate a three-dimensional effect in a pictorial display according to their reflection properties. Viewing artwork with glasses that have diffraction and refraction properties may change a 2D image into a three-dimensional image. Basically a diffraction grating bends different wavelengths at different angles and red light is bent more than blue light whereas other colors like green are bent at intermediate angles (Steenblik, 1991; Ucke, 1998)). Thus red areas in an image are interpreted to be closer to a viewer, and blue areas seem to be further away. The effect on a viewer is well documented in Figure 5. However the disadvantage of this three-dimensional viewing of art is the wearing of glasses, but this technique is very useful as a training tool to better recognize color pattern.

There is also a gender difference for the perception of color, because females can see more shades of colors than males, and this difference is caused by deviations in the perceived saturation of green–yellow stimuli (Murray et al., 2012; Jain et al., 2010). As an outcome, females are better at discriminating among colors and have a wider color spectrum than men (Jisha et al., 2023). That shows that obviously men and women exhibit dissimilar behavior, and females reveal a more differentiated color perception compared to males (Fider and Komarova, 2019). This seems to have an impact on the selection process in the arts, because longer wavelengths in the red are associated with warmer colors and the green region may appear greener to women than to men. However, woman can distinguish very small differences between certain colors that men cannot. In this context it is interesting to compare the gender of contact persons in events that are related to art. As an example, by analyzing the number of contact persons in visual art events including galleries in the San Diego area in 2025, that out of 219 listed occasions about 79.5% were guided by women and only 20.6% were affiliated with men (unpublished author's study). A similar scenario on female participation seems to be symptomatic in other cities and regions. However, this high percentage of women in more managerial position does not reflect the role in the production of actual artwork by women nor does it explain whether socio-economic factors create this difference and not just different color perception.

Figure 5. *A. Color-coded painting; B. The effect of a three-dimensional illusion of a two-dimensional painting by wearing glasses with diffraction grating (from an exhibit in the German House, New York).*

3. Color and emotions

It is generally accepted that taste and color are based on emotional reactions when viewers are exposed to art, and such emotional reactions may play a role in evaluating pieces of art. However judgment of visual art is based on a mixture of low- and high-level features in artwork and subjective value evaluation can be predicted across individuals, at least in part, as a "systematic integration over the underlying visual features of an image" (Iigaya et al. (2021). Emotional responses from abstract paintings may be even so strong that they can be identified by electronic recognition systems. It was shown with statistical pattern extraction that paintings are associated with positive and negative emotions that can be used to predict a person's reaction on viewing a painting (Yanulevskaya et al., 2012; Alameda-Pineda et al., 2016; Castellano and Vessio, 2021). Thus computer vision techniques can extract features that make it possible to identify in abstract paintings to a high degree the emotions that are generated by color, shapes and texture on the human emotional response (Sartori, 2014). This has an interesting effect, namely that mood variations of a viewer may influence the capability to differentiate between particular pieces of art and a selective preference for specific colors. Furthermore, variations in moods are also related to seasonal changes and changes in natural light conditions that are a function of climate and latitude. These effects are grouped as seasonal affective

disorder (SAD) symptoms and typically may begin in fall and can emotionally influence a person's judgment on color and taste. As light intensity also is a function of latitude, residents in the north are more vulnerable to SAD than those living in the south, because the southern countries have more daylight in the late fall and winter (Rosenthal et al., 1984). Schloss and Heck (2017) reasoned that during the fall season, dark-warm colors are preferred, and therefore dark-red, dark-orange and dark-yellow colors are preferred more during fall seasons. This shows that a viewer's color preferences may change according to seasons, and color-associated objects may be received differently when evaluated at different times.

Artists express their own mood and their color perception and inspire viewers with their work. As an outcome, a viewer of abstract paintings is exposed to the color selection that was applied by an artist according to a specific mood situation. It is not a coincidence that artists and viewers have a preference for certain colors that is related to their emotional associations and their psyche. For instance red is a very intense color and may be associated with emotions and excitement, yellow is considered a happy color, whereas blue relates more to water and the sky. Black is known to relate in most societies to darkness, melancholy and is in many societies associated with death and mourning. Some of those moods can be unveiled in paintings with color selection for simulating various levels of emotions. It seems to be agreeable that specific colors initiate emotions that can be deducted from abstract paintings of which samples are shown in Figure 6. It is irrelevant which season the pictures can be assigned to, however some deductions can be drawn from the color arrangement. Figure 6.1 has been crafted with a wide color pallet and appears as a rather cold reminder of a winter scenario while Figure 6.2 has a wider color pallet with a more joyful display and relates better to a spring season, whereas Figures 6.3 and 6.4 dominate with somber colors that preferably refer to a fall scenario.

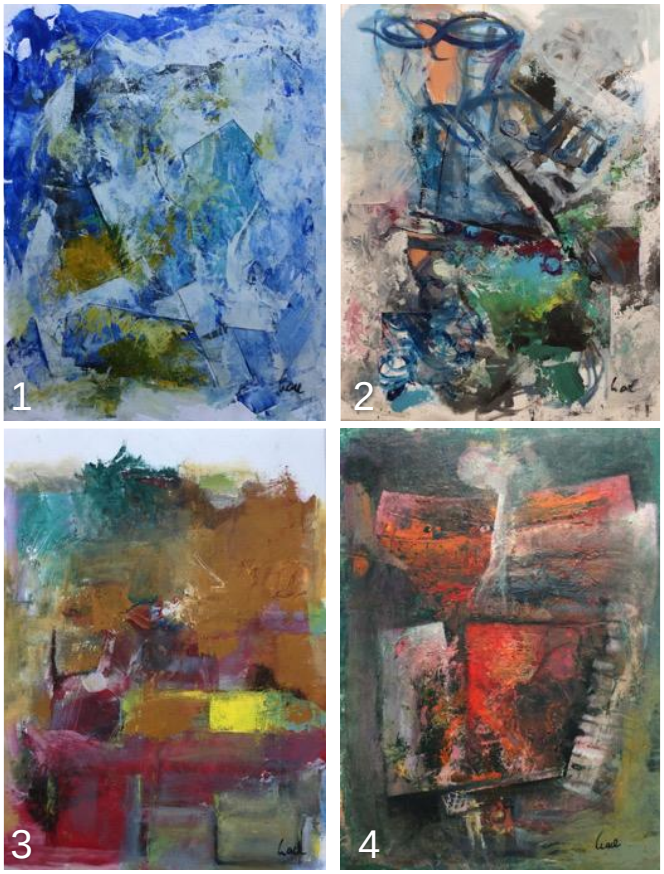

Figure 6. *Examples of different color arrangement to simulate preferred seasonal color changes.*

Many artistic expressions stimulate mental processes that are below the threshold of consciousness and can be perceived by a viewer without being aware of it, and interaction between art work and a viewer can also lead to a reciprocal interaction. Such reciprocal interaction and subconscious feedback

can be demonstrated with a display of expressions of a three-year old child working with bold strokes shown in Figure 7A. An adult artist who concurrently painted as shown with two examples in Figures 7B and 7C that show an unintended transmission of lines and strokes to the artist's own work. The two paintings deviated from the expressions the artist used normally with his own techniques. This example shows that focusing on the expression of another person's perception, regardless of educational level or training in art has an emotional retroflection on the perception of art by another individual.

Figure 7. *A. Unaware motivation by child's drawing (Olivia) at age of three with oil pen and crayon on paper 32" X 16". Figure B and C were painted during the same period by an artist.*

4. Complexity of judgment and concluding remarks

Only a few perspectives on color and taste are covered in this study, however the topics addressed show the many complicated psychological aspects that would require a more thorough analysis on judging what is good in abstract art or what is not. The complexity in evaluating abstract art is further demonstrated with a study by Sidhu et al. (2018) that showed even a distinction between liking and beauty ratings for abstract paintings, and a comparison of ratings showed liking ratings were much more predictable than beauty ratings. However the educational level of viewers and experience in understanding visual perception of abstract paintings may play the major role. This statement can be underlined with a comparison in which three independent viewers were exposed to the same artwork but evaluated the work very differently. A professor in geology found that "upon closer inspection, human figures occasionally emerge from this cosmos of color. As a geologist, I naturally have different associations than others. My summary could be described as Man, trapped in the lattice of a crystalline, yet opaque and confusing world of matter. Of course, squares immediately bring pyrite to mind for me." The second viewer, who has decades of experience as an art writer and artist career coach, looked at the same art work very differently, "With a superior handling of graduated tones, gestures, and a variety of translucent and transparent applications of paint, he achieves a robust rhythmic expression.

Colors and forms coalesce in an exquisite sense of harmony, balance and depth." The third viewer wrote as an art critic and published the comments as "…the abstract paintings are bold. Bright aquas blend with midnight blues, brushed smoothly across large expanse of canvas. Drips of black paint seem to stream from craters of brown punctuated with dazzles of rich red. Still other paintings draw the eye with oranges and shades of yellow which liberally mingle with greens, pinks and blues seemingly atop shades of brown and cream." What does that seemingly discrepancy in evaluation has to do with color and taste? All three viewers may have experienced the same emotional feeling, but they express them differently based on a distinctive educational background and through the use of a specialized vocabulary. The possible feedback is that the information contained in these statements will be further communicated to an audience that is equivalent to the communication level of the evaluator, but it may not relate to any other audience, and a shortcoming in this approach is the subjective opinion on what is good and what is bad. A possible weighing on the importance of some of the above arguments for evaluating an artwork has been undertaken by rating qualitatively some factors that have been described above by using a scale of 1 to 5, and are shown in Table 1.

Influence on perception	Comments	Rating
1. Gender; Female/Male	Significant differences	4
2. Eye Condition	Serious interference	4
3. Emotions	Time and season dependent	3
4. Cultural	Important differences	3
5. Education	Most important	5

Table 1. *Qualitative evaluation on color perception that may have a feedback on selecting and judging abstract art.*

The gender factor seems to be significant, and due to the better color perception by women, the selection of an artwork may differ from a selection by men. Eye degeneration is another factor that has serious consequences on image perception; however, it develops at a later stage in life. Cultural differences seem to be an important factor in the perception of color and the interpretation in connection with taste. The ranking established in Table 1 is of less importance if an item is selected for the private sphere, but it may have significance when abstract paintings are publicly shown or are selected, for instance, at a competition or in selection for display in a gallery.

It can be recapitulated that the evaluation of color and taste is subjective and is based almost entirely on the personal experience of the viewer. Finally, it is important to note that cultural perceptions also affect how we perceive color, because different cultures have varying associations with specific colors, and these perceptions can affect how color is interpreted in other contexts. For example, while white may be associated with purity in western cultures, it is considered the color of mourning in eastern cultures, but some colors remain particularly constant across populations. That means perception of an abstract painting may be powerful in one culture but not necessarily in another. All above arguments do not lead to a satisfactory answer to the question whether a particular taste or color is the right one or not. Therefore the answer to this question has to wait until science delivers more information on this issue, but meanwhile we have to stay with the Latin expression, *De gustibus et coloribus non est disputandum*, meaning no necessity to argue about tastes and colors.

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