

# Colour Coordinates, and Their Multimedia Installation

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**Abstract**—The project is based on *Farbenlehre* [1], a five-volume work by Johann Wolfgang Goethe from 1790, which, according to the author, was the most important of his works and the result of ten years of experimenting with the light spectrum. He analysed the process of colour perception, the influence of colour on the psyche and the importance of the optical apparatus in perception, as based on his observation, and rated all the phenomena of colours in accordance with their effects on us. Coloured light changes our perception, influences our feelings and the way we see reality. His wonderful, poetic, exalted descriptions of light in *The Theory of Colour* greatly differ from cold scientific terminology. After a short period of fascination with Goethe's theory, especially among the artists of his time, the theory had been forgotten. Goethe's experiments involving the water prism and black-and-white optical forms have inspired naN group to create the project #FF00FF and *Colour Coordinates* using optical effects created by processing image with water, air, crystal and glass.

was quite opposite to Newton's. Goethe founded his theory on the eye's experience of colour and contained detailed descriptions of phenomena such as coloured shadows, refraction and chromatic aberration. Goethe observations were based on experiments with semi-transparent media such as air, dust or moisture. The most important colours for him were yellow and blue, akin to light and dark. Goethe believed that shade is part of light and darkness is not an absence of it; colour resulted from interactions between light and shadow. Yellow is light which has been dampened by darkness; Blue is darkness weakened by light. Goethe disagreed with all of Newton's ideas very quickly, because his ideas didn't take human's perception into consideration. This is the biggest impact in contemporary colour theories. In his times, the theory was widely adopted by the art world. Scientists rejected his theory soon; now it is forgotten.

## I. BEGINNING OF COLOUR SCIENCE

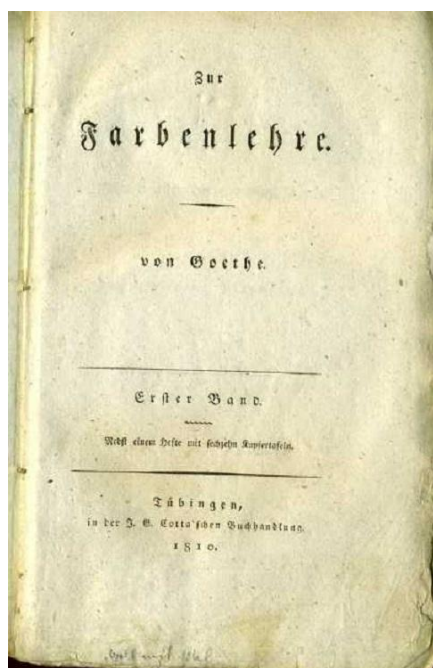


Figure 1. Cover sheet of Goethe book

In 1704 sir Isaac Newton published *Optics* – one of the most important books explaining colour as a refraction of light, playing a main role in optics. A hundred years later Johann Wolfgang von Goethe published his idea which

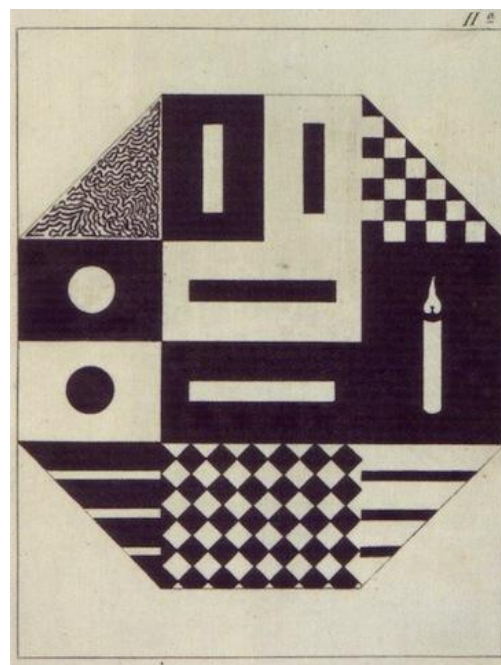


Figure 2. Johann Wolfgang Goethe, Plate IIa (Zur *Farbenlehre*), Tübingen, 1819

Publishing “Theory of Colours,” Goethe considered it his most important work and the result of ten years of experimenting with the colour spectrum. Goethe recommended to buy the book with a water prism table with black-and-white patterns for personal experiments, but the publisher protested, nearly bankrupted. The book

was black-and-white with watercolour handmade plates added to the book.

He observed that the colours emerge at an edge between light and dark and this effect was fundamental to the creation of the spectrum. When viewed through a prism, the orientation of the light–darkness boundary with respect to the prism's axis is significant. With white above a dark boundary, we observe the light extending a blue-violet edge into the dark area; whereas dark above a light boundary results in a red-yellow edge extending into the light area. Goethe was intrigued by this difference.

Wolfgang Goethe's most favourite colour was magenta. This colour does not exist in the spectrum; it is a mix of the two colours on the ends of the spectrum – violet and red. Goethe put his favourite colour in the centre of his colour circle in order to join the ends of the spectrum. Goethe completed his colour wheel by recognizing the importance of magenta and its essential role in the complete colour circle, a role that it still has in all modern colour systems. There is another very important repercussion of his theory – his observations on the effect of opposite colours led him to a symmetric arrangement of his colour wheel consisting of 6 colours (Newton's 5).



Figure 3. Goethe's colour diagram, one of the main element of his theory

Johann Wolfgang von Goethe with cooperation of Friedrich Schiller prepared the scheme of human's tempers connecting with colours and the colour wheel [2]. They paid attention to the psychological experience of light and colour, the great meaning of human's perception and influence of the colours on human mood, psychology, physiology. They found 6 associations in the colour wheel: red was assigned to beautiful, orange to noble, yellow to good, green to useful, blue to common and violet to unnecessary. Even if we consider such a connection as just amusing, we cannot deny the importance of colour and mood.

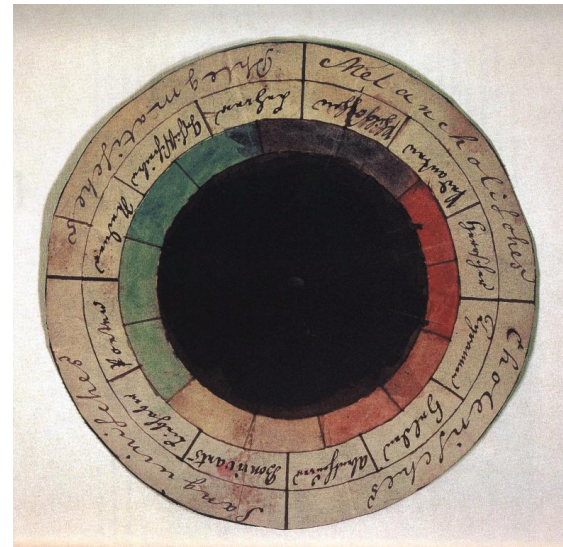


Figure 4. Johann Wolfgang Goethe and Friedrich Schiller, *The rose of temperaments*, 1799, aquarelle and ink on paper

Goethe was the first to systematically study the psychological, allegorical, symbolic and mystic effect of colour. The six qualities were assigned to four categories of human cognition:

the rational (Vernunft) to the beautiful and the noble (red and orange)

the intellectual (Verstand) to the good and the useful (yellow and green)

the sensory (Sinnlichkeit) to the useful and the common (green and blue)

imagination (Phantasie) to both the unnecessary and the beautiful (purple and red)

He analysed the influence of colour on the psyche and the importance of the optical apparatus in perception, as based on his observation, and rated all the phenomena of colours in accordance with their effects on us. Coloured light changes our perception, influences our feelings and the way we see reality.

His wonderful, poetic, exalted descriptions of light in *The Theory of Colour* greatly differ from cold scientific terminology. One of the most important poets in the World is known rather as an author of *Faust* and *The Sorrows of Young Werther* than a scientist...

## II. EXPERIMENTAL PART

Farbenlehre by Johann Wolfgang von Goethe became the inspiration of this artistic installation, which uses water prisms, mirrors, optical structures, coloured lights, video projections and interactive programs. The installation was exhibited for a few times in Kalisz, Warsaw, and Cracow.





Figure 5. #FF00FF exhibition, the glass prism filtered a moving image inspired by graphics from Farbenlehre

The project consists of 6 parts:

- a glass prism filled with water, which filters a moving image displayed by a projector inspired by graphics from Farbenlehre.

The interaction of water and colourful images gives a sensation of double refraction. Looking through the glass filled with clear water testifies main Goethe's idea: with white above a dark boundary, we observe the light extending a blue-violet edge into the dark area; whereas darkness above a light boundary results in a red-yellow edge extending into the light area. Arising of colour at light-dark boundaries creates the spectrum.

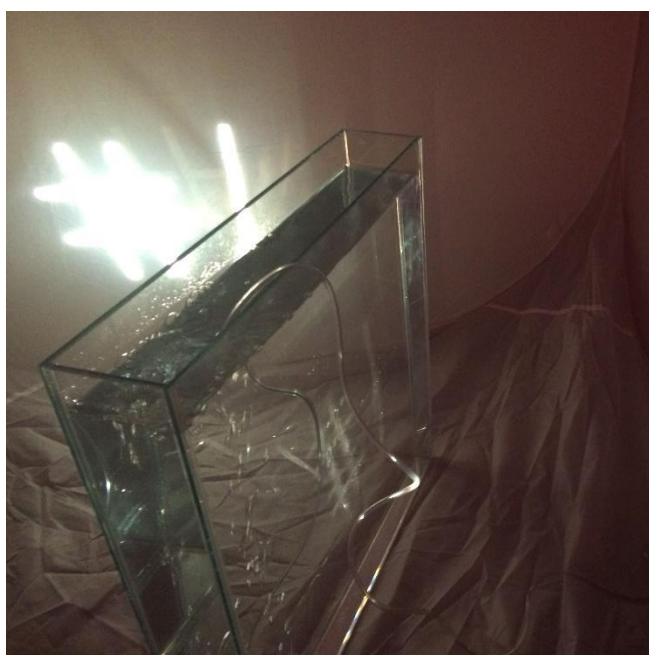


Figure 6. #FF00FF exhibition, the cuboid container with water for slit projection

- a cuboid container with water inside a shadeless tent serving as a screen and filter for slit projection.

White condensed light, when projected through an edge of the water container, splits into a spectrum. This Newton's experiment is well known. And vice versa: looking through semi-transparent, unclear water gives the sensation of yellowish light or blueish dark.



Figure 7. #FF00FF exhibition, found footage based on *Faust* by Friedrich W. Murnau

- a mirror object with an amount of water reflecting and deforming a moving image – found footage #FF00FF – three-minute-long digital video based on *Faust* by Friedrich W. Murnau, 1926.

We identified found footage in magenta as the state of the soul close to the poetical trance that manifests spirituality of art. Faust's illumination – the truth about the question of existence of the Universe. This phenomenon, for artists, is a synonym of challenge, creation, crossing the borders – searching new aesthetic and artistic values.



Figure 8. #FF00FF exhibition, the crystallizing object

- a mirror object containing a fragment from Goethe's *Faust: Verweiledoch! Du bist so schön!* (*Beautiful moment,*

*do not pass away!*) – referring to the words of a scientist searching for the truth to the point of giving his soul to the devil. The growth of the crystallizing object is the “growth” of the idea of magenta; illumination; *eureka*. This installation is in process; every day the solution becomes more and more crystallized – like the Faustian moment.

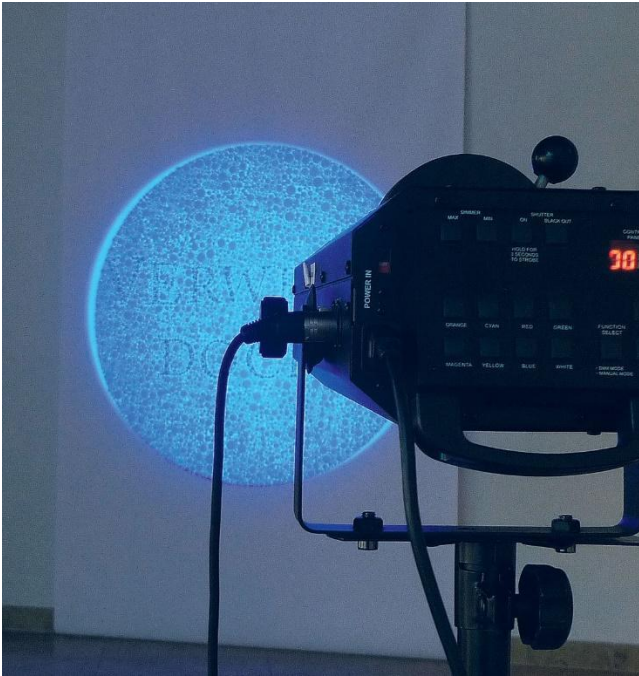


Figure 9. #FF00FF exhibition, projection on pseudoisochromatic Ishihara plates

- projection of RGB colour from a spotlight onto an image created to resemble pseudoisochromatic Ishihara plates testing the ability to differentiate between colors. The installation tests that ability for shapes in a different way, also containing a fragment from Goethe's Faust: *Verweiledoch! Du bist so schon! (Beautiful moment, do not pass away!)*. Changing light changes perceived space and sensation.



Figure 10. #FF00FF exhibition, the interactive software

- an interactive program: colours shown on the monitor described with hexadecimal notation by humans' action become magenta (*#FF00FF*). This computer application allows to observe changing shining colours codified with numbers known only for the machines. The code, impossible to decode, is completely abstract, not referring to human's perception. Hexadecimal notation can describe more than 16 million colours – more than the human eye can see.

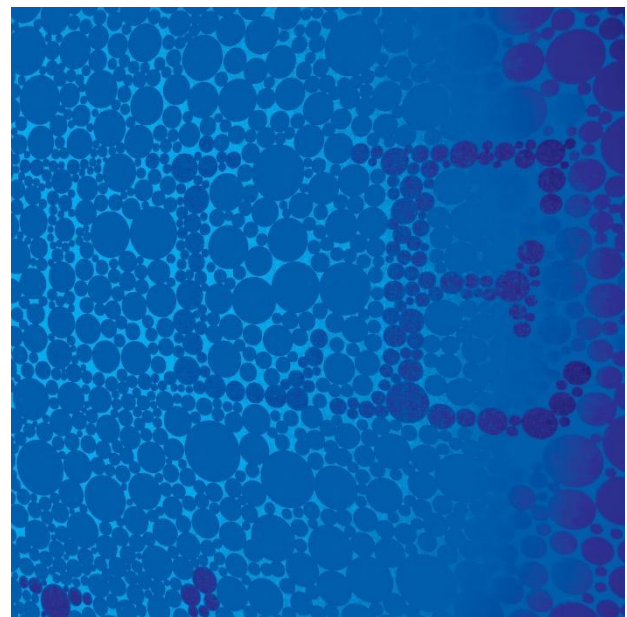


Figure 11. #FF00FF exhibition, pseudoisochromatic Ishihara plates

The multimedia installation is inspired by Theory of Colours by Johann Wolfgang von Goethe, where he presents his views on the nature of colours and their perception by humans. The installation gives viewers an



opportunity to check the process of colour perception and the importance of the eye in perception. In spite of Goethe's *Farbenlehre* being rejected, it still can be an inspiration for artistic installations using traditional techniques, multimedia facilities, video projection and interactive programs. His unpretentious approach to science and search for unknown fields can also be an inspiration for scientists [7].

Works such as *1:200000* and some older ones related to the phenomena of light perception use the language of multimedia as a structure of visual message that is not always clear, yet very carefully adjusted to match the essential content that inspires the members of *naN* [8].

The latest projects, e.g. *#FF00FF*, have been realized with the help of a programmer, who contributes to the character of the message of the works using interactive forms created just to suit them.

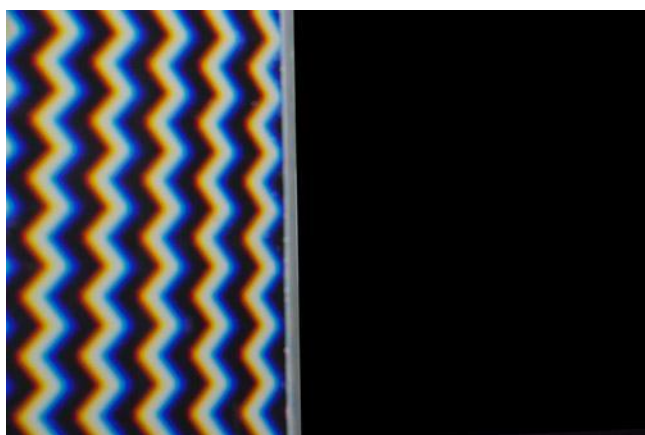


Figure 12. *#FF00FF* exhibition, the glass container that gives sensation of double refraction

### III. CONCLUSION

The multimedia installation is inspired by *Theory of Colours* by Johann Wolfgang von Goethe, where he presents his views on the nature of colours and their perception by humans. The installation of a glass prism filled with water, which filters a moving image displayed by a projector; water container with slit projection; a mirror object reflecting moving image; the growth by crystallizing of the object; an image created to resemble pseudoisochromatic Ishihara's plates and coloured lights and an interactive computer program gives viewers possibilities to check the process of colour perception and the importance of the eye in perception.

### REFERENCES

- [1] Goethe, J.W. 2003. *Farbenlehre*, VerlagFreiesGeistesleben, ('The Theory of Colour'). Stuttgart
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- [3] J. W. Goethe, *Farbenlehre*, VerlagFreiesGeistesleben, Stuttgart 2003.
- [4] Müller, O. 2008/2009. Goethe izaradyświatabarw. *Autoportret, pismo o dobrejprzestrzeni*, vol. 4–1(25-26), p. 5–14
- [5] *#FF00FF* exhibition: <http://wpa.amu.edu.pl/strona-glowna/yciewydziau/wystawy/wernisaz-prof.-a.-a.-panasiewiczow>. accessed on: 27 Now 2016. <http://wpa.amu.edu.pl/strona-glowna/yciewydziau/wystawy/wernisaz-prof.-a.-a.-panasiewiczow>
- [6] <http://www.calisia.pl/articles/numer-ff00ff-w-uniwersyteckiej-galerii-sztuki>
- [7] The exhibition *#FF00FF* was presented in the *University Gallery* in Kalisz, February 2016 Partners of the project: Adam Mickiewicz University in Poznań, Faculty of Pedagogy and Fine Arts in Kalisz and in *Schody Gallery* Warsaw, October 2016 and *Lokator Gallery* Krakow, 2015.
- [8] *naN* – not a Number – is An artistic group formed in 2015. It is primarily based on the collaboration in artistic activities of Alicja and Adam Panasiewicz. The artistic duet is mainly concentrated on artistic works using the language of new media that make for great liberty in creation, and vagueness of interpretation, of the projects on intermedia.