

COLOR ANALYSIS AND PIGMENTS TECHNOLOGY IDENTIFIED FOR PRINTING ROMANIAN POSTAL STAMPS

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ABSTRACT: The paper deals with the analysis of colors and pigment technology identified in the printing of Romanian postal stamps. A brief history of the pigments used to print postal stamps is provided. The presented methods are a novelty in the philatelic field, wanting to create a connection between the world of scientists and that of collectors (terminology, technique, PC). Most of the research done so far is based on the study of colors.

KEYWORDS: pigments, ink, color, color system, postal stamps.

1. Introduction

Ink is the classic material traditionally used for writing, that is, for recording graphic signs on media suitable for writing texts. Any type of ink is a mixture of ingredients in which two categories of main components are distinguished, namely, basic components and secondary components. The basic components are dye or pigment, liquid medium and binder. The dye or pigment is the fundamental writing element. It determines the characteristic color of the ink. Pigments are the colored materials in the composition of the ink. In this respect, a clarification is needed: there are dyes and pigments themselves.

A substance appears colored when the light it reflects or transmits lacks radiation of certain wavelengths and, as a result, the spectra show absorption bands. These are due to the presence in the molecule of groups of atoms called chromophores. Natural dyes dissolve in various liquids while the actual pigments of natural origin are colored materials insoluble in water or solvents. The liquid medium, also called solvent or, as the case may be, dispersion medium, is the substance in which the dye is dissolved or the insoluble pigment is dispersed. The amount of liquid in an ink is proportional to the writing instrument and the writing medium. The most common liquid media for the preparation of inks have, over time, been water and oils.

The binder is usually a substance or adhesive that ensures the stability of the pigment dispersion, improves the fluidity of the inks and ensures their fixation on the substrate during writing and after drying. The most used binders were vegetable glues (gum arabic, cherry glue, resin glue, starch, honey, sugar) and animal glues (gelatin, egg white, fish glue). Synthetic glues have been used in recent decades.

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2. State of the art

Inks are classified according to several criteria: durability, color, application procedure. Durability or stability over time divides the inks into stable inks that have a good behavior over time, good resistance to environmental factors and a neutral character in relation to the graphic support on which they are applied and unstable, water-sensitive inks, to light etc.

The color divides these preparations into black inks, colored inks, and invisible inks.

Carbon ink or soot ink is the oldest known type of ink in history.

Fig. 1 shows a study made by Professor Dr. Adrian Marian on pigments used in Romania (prehistory -1900). The area of interest of the study pigments is between 1858 and 1900.

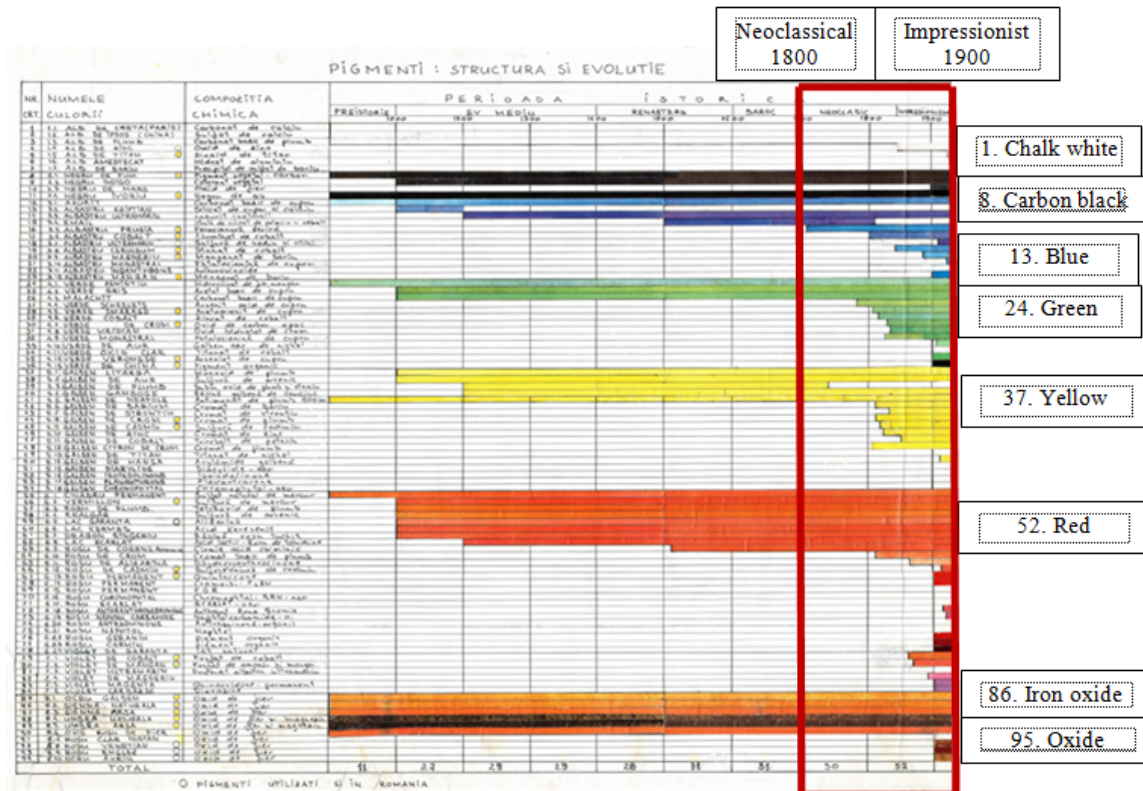


Fig. 1. Pigments - evolution from prehistory to 1900 [6]

For the traditional preparation of this type of ink, proceed as follows: collect and dry some spherical plant formations called scabies that usually grow on the back of oak leaves but also on the leaves of other plant species in Europe, Asia and North Africa.

The pigments used are of a very wide variability. Their main feature is that, unlike dyes, they are not soluble in water and had to be prepared in the form of dispersions. These pigments were originally obtained by processing colored earths: iron oxide (red), lead red or minium, cinnabar or chinovar called vermilion (red mercury sulfide), white zinc (zinc oxide), lapis lazuli blue), wax (white pigment, basic lead carbonate), chalk, azurite (azure blue, basic copper carbonate).

Other pigments were also used for the red color: minium (lead), alizarin (dihydroxy-anthraquinone), glitter (trihydroxy-anthraquinone), guar (extracted from *Rubia tinctorum* roots), carminic acid (a trihydroxymethyl-anthraquinone glucoside).

Fig. 2 shows the Colors Circle 54 - SCR 5959 which shows the main shades of colors according to the Romanian standard. The first printing inks were made of soot (carbon black) and were used to dye the wooden plates on which the printing text was engraved. There is a wide variety of printing inks depending on the pigment or dye used, the type of varnish and the purpose for which they were made. Black printing inks, generally based on carbon black, have good durability over time.

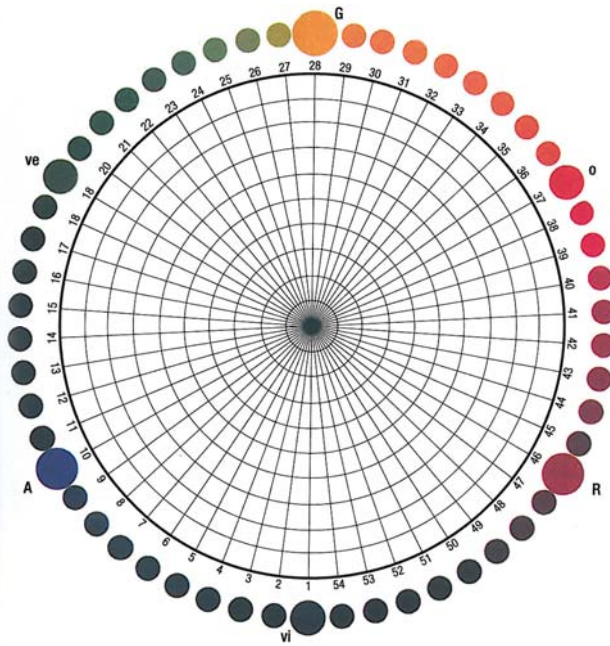


Fig. 2. Colors Circle 54- SCR 5969 [8]

The Michael Color Guide is used to identify the colors of stamps in Germany, using the pigments from that country [2] in accordance with the current standard. The color palette has a hole with a diameter of 5 cm where the stamp is placed (Fig. 3).

In Fig. 4 shows the color model used by X-Rite to calibrate the devices.

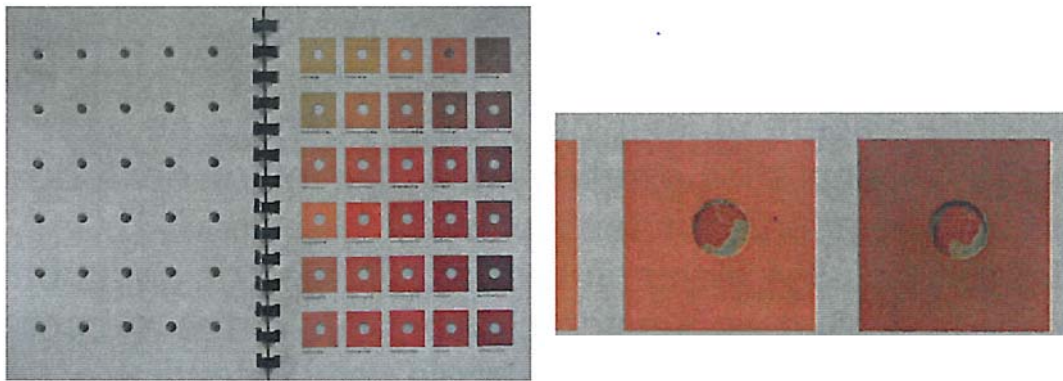


Fig. 3. Color card (left), stamp color identification (right) [1]

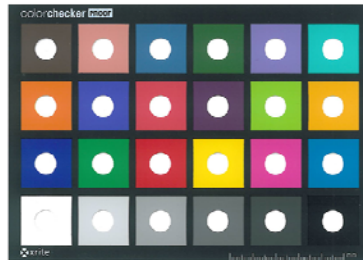


Fig. 4. X-Rite color palette

3. Case study

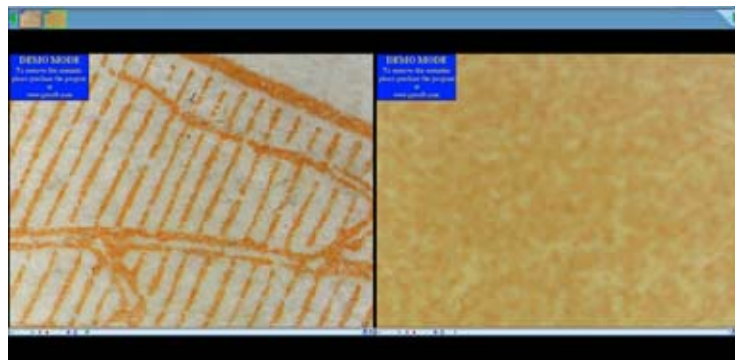
Papers of value such as banknotes, stamps, personal documents etc. are typographical products which are executed using special technologies which should ensure their protection against forgery. It is necessary to analyze the postal stamps as widely as possible, because in Romania no scientific studies have been carried out, no regulations have been established for color cataloging or for the detection of forgeries. It must establish the basis for stamping the stamp, the color and positioning in order to measure the stamps, their scientific cataloging.

This paper aims to analyze the pigments used in Romania until 1900. For this purpose I proposed two working methods.

Method I of color determination used a duplex microscope with calibrated devices for researchers and for people who have financial possibilities (microscope, laptop, high performance software) as it is shown in Fig. 5. The duplex microscope was designed and executed during the research by the author. This contains two digital microscopes mounted in parallel which can move simultaneously on the Oz axis and an adjustable and graded support for positioning the samples on the Ox and the Oy axes. The microscopes are calibrated from an optical and spectral standpoint at the beginning of the study based on the imposed tolerances. The visual field of the microscopes is illuminated in a controlled manner according to a standard light source, to properly ensure the correctness and consistency of the measurements [8].



a) the designed comparator device



b) Color stamp (4B) digital microscopes I and II

Fig. 5. Duplex microscope

Method II - I set out to create a Romanian Chromatic Circle, using the SCR 5969 model (its colors). This method is intended for philatelists who do not have modern technology.

The Chromatic Circle (Colors Star) is a creation of Johannes Itten [7] and consists of the following colors: primary colors + secondary colors + tertiary colors (Fig. 6). The primary colors are red, yellow and blue. The secondary colors are made by combining primary colors: red + yellow = orange; yellow + blue = green; blue + red = purple. The tertiary colors are created by combining a primary color and an adjacent secondary color: red + orange = orange-reddish; red + purple = purple-red; blue + purple = indigo; blue + green = turquoise; yellow + green = green-yellowish; yellow + orange = gold.

Based on the color samples printed with Romanian pigments, I made colorimetric measurements, I mounted gradations for each color, 12 segments, I managed to design a color palette, which is shown in Fig. 7 for primary colors and in Fig. 8 for secondary colors.

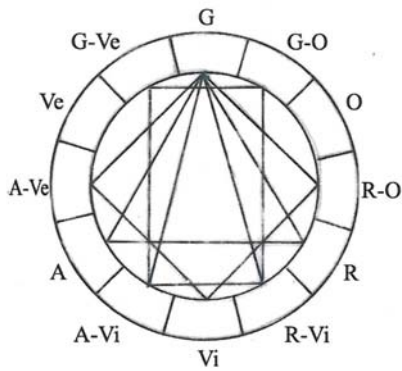


Fig. 6. Chromatic Circle (Colors Star)

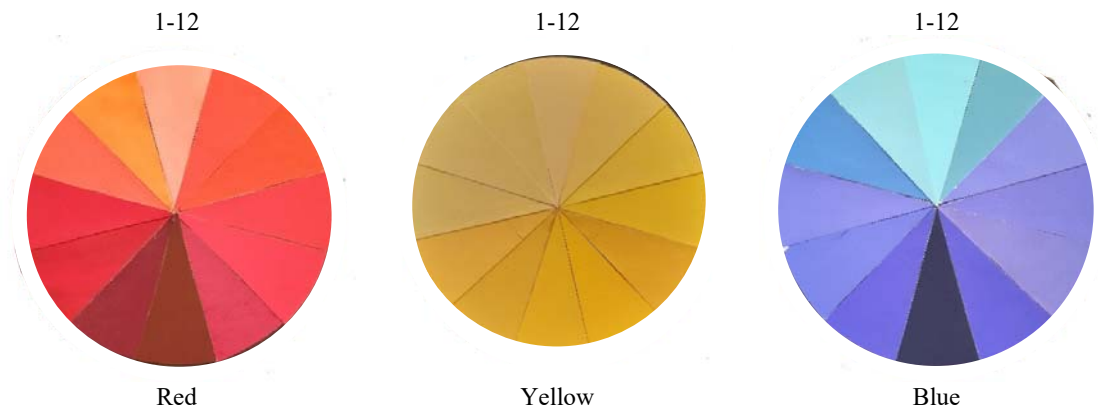


Fig. 7. Primary colors

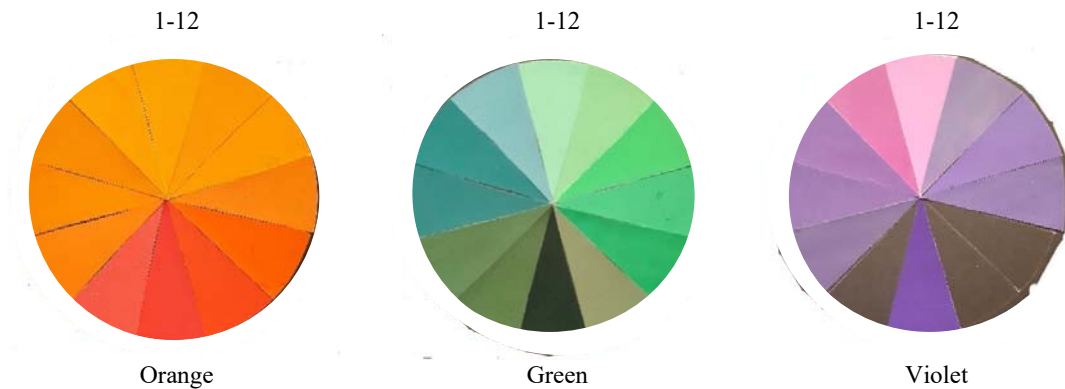


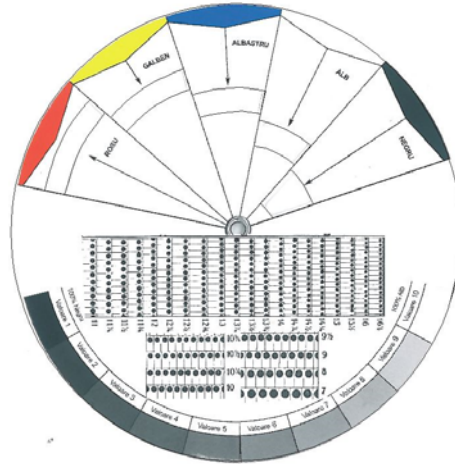
Fig. 8. Secondary colors

Fig. 9 shows the Romanian Chromatic Circle proposed by myself. By superimposing Face I and Face II, the Romanian Chromatic Circle is obtained. By rotating the two circles, the approximate color of the identified one is obtained.

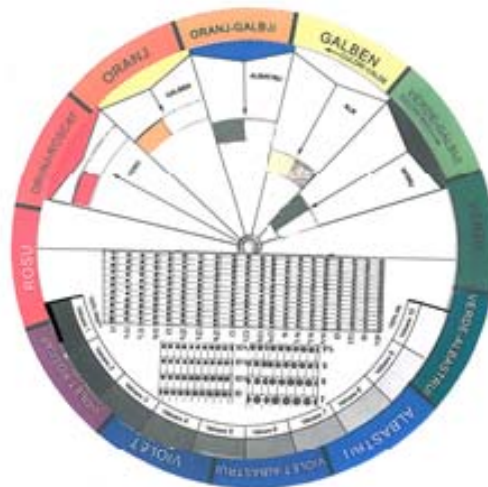
Fig. 10 presents the series “Wheat spike” published in 1893/1898: 1 Money - brown; 1 ½ Money - black; 3 Money - reddish brown; 5 Money - blue; 10 Money - green; 15 Money - red; 25 Money - purple; 40 Money - green-blue; 50 Money - orange; 1 Leo - light brown and pink; 2 lei - orange and brown.



a) Romanian Chromatic Circle 5969 (face I)



b) Romanian Chromatic Circle 5969 with ondotometer (face II)



c) Romanian Chromatic Circle 5969

Fig. 9. Romanian Chromatic Circle 5969 opened



Fig. 10. King Carol I - "Spic de grâu" with watermark PR -II, III, IV, V (1893)

Fig. 11 represents the Romanian Chromatic Circle in which I positioned the stamp from the "Wheat Ear" series published in 1893/1898 by 3 Money - reddish-brown which was compared to the color obtained from the circle. The resultant is correct.

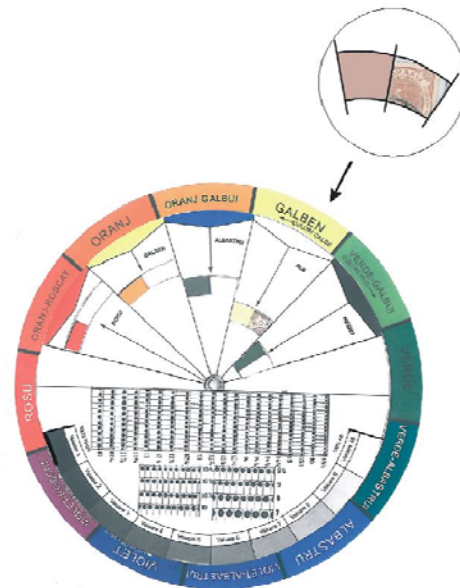


Fig. 11. Romanian Chromatic Circle 5969

4. Conclusions

Papers of value such as banknotes, stamps, personal documents etc. are typographical products which are executed using special technologies which should ensure their protection against forgery.

The work presents a characterization of the Romanian postal stamps "Wheat Spike" which come from the personal collection of the author in order to propose a method of identifying pigments to identify colors on stamps printed until 1900.

The use of color standards (SCR 5969) is necessary to establish the cataloging of the colors of the stamps, the colors assumed by the collector are now mentioned in stamp documentation.

It is necessary to analyze the postal stamps as widely as possible, because in Romania no scientific studies have been carried out, no regulations have been established for color cataloging, for the detection of forgeries and legislation to apply future regulations.

The subject must establish the basis for stamping the stamp, the color and positioning in order to measure the stamps, their scientific cataloging.

Scientific studies in Europe are carried out by highly qualified people, at a higher level than collectors, who cannot interpret the results of research (Method I).

The solution (Method II) is the use of the Romanian Chromatic Circle (SCR 5969) for philatelists who do not have the technology and method I.

Based on the color samples printed with Romanian pigments, I made colorimetric measurements, I mounted gradations for each color, 12 segments, I managed to design a color palette, named Romanian Chromatic Circle 5969. By rotating the two circles from face I and face II, the color of the postal stamp is obtained. The stage of making and measuring color samples printed with Romanian pigments is very important. High-performance printing and measuring equipment was used.

5. References

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