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**TRANSFORMATION OF THE 18TH
CENTURY METHOD OF TRANSFERRING
GRAPHIC IMAGES ONTO CERAMICS INTO
THE MODERN TECHNOLOGY IN THE
CONDITIONS OF THE GRAPHIC ARTS
WORKSHOP. METHODS OF
TRANSFERRING GRAPHIC IMAGES ONTO
CERAMICS**

**An artistic and research project carried out
at the Interdisciplinary Studio of Classical
Techniques, Faculty of Graphics, Academy
of Fine Arts in Warsaw**

ABSTRACT

The article deals with the implementation of an 18th-century method of transferring graphic images onto ceramic substrates based on a contemporary graphic art workshop. Popularised in the 18th and 19th centuries in England, the technique called transferware used engraving matrices, and the decoration was transferred onto ceramics using tissue paper and subsequently fired in a two-stage process. An important element in the implementation of the new method of transferring graphics onto ceramics is the development of recipes for contemporary low-toxic or non-toxic ceramic paints in the basic colour range - vitreous and underglaze ceramic pigments. The pigments created and tested, due to the range of physical parameters studied, can be spectroscopically studied objects. The process of implementation of the transfer also describes the study of the image carriers, from intaglio to relief printing matrices, the development of recipes for the composition of graphic-ceramic paints, firing methods, methods of image application, and the papers used. Preliminary experience shows that not only the transfer of graphics - an image from a graphic matrix onto ceramics is possible, but also it produces interesting artistic effects

without the use of toxic solvents. Recreating old methods of transferring graphics onto ceramics in combination with new technologies is an innovative idea. The method of transferring the matrix onto ceramics creates an innovative workshop and allows an interdisciplinary studio to operate within the structure of artistic printmaking. The aim of implementing the new method of technology is to use it for artistic solutions.

KEY WORDS

Marek Cecuła; Jean-Baptiste Le Prince; John Sadler; Małgorzata Warlikowska; Staffordshire ; Ćmielów Design Studio; Academy of Fine Arts in Warsaw; Baume scale; Institute of Ceramics and Building Materials in Warsaw; ceramics; pigments; ceramic pigments; porcelain; transferware; faience; clay; ceramic production; graphics; printmaking; etching; aquatint; linocut ; spectroscopy; digital ceramic printing

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Transformation of the 18th century method of transferring graphic images onto ceramics into the modern technology in the conditions of the graphic arts workshop. Methods of transferring graphic images onto ceramics

An artistic and research project carried out at the Interdisciplinary Studio of Classical Techniques, Faculty of Graphics, Academy of Fine Arts in Warsaw

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Introduction

Research on the reconstruction of classical methods of transferring prints onto ceramic substrates was undertaken last year at the Interdisciplinary Classical Techniques Studio (Academy of Fine Arts in Warsaw). Based on our common interest in classical printmaking as well as porcelain, we started to analyse an interesting and forgotten issue, i.e. the transfer of images onto ceramics using a printmaking matrix. Our aim was not only to reconstruct the 18th century method of decorating porcelain, but also to implement it into the contemporary workshop of graphic techniques and to use it for our artistic solutions.

History of the transfer, of the method and its application

The method of transferring a graphic image from a matrix to ceramics, discovered in Italy, was popularised in 19th century manufactories in England, especially in the Staffordshire region. One of the inventors of transferware was John Sadler, an 18th century English printmaker, who, based on his observations of children's games, developed the technique, which allowed for the mass transfer of prints onto ceramic plates¹. Transferware is a form of decorating pottery where the design was applied by transferring an image from a hand-engraved copper or steel plate to wet tissue paper and then to the body of the pottery being decorated. Transferware was most commonly found on ceramics, but also on porcelain. Most transferware was produced in the Staffordshire region of England. The copper plate was meticulously hand engraved, with the design using a variety of methods (including spot stamping, which creates a shading and tonal variety) and tools such as a roulette or engraving stylus, which make pigment penetrate into the V-shaped grooves. The depth of engraving and the precision of the line or dot determined the strength of the colour. It must be remembered that it took several weeks to make a copper plate. The finished engraved plate was heated on a cooker. A metal oxide (usually cobalt oxide) was mixed with printing oil and rubbed into the grooves of the plate to ensure a good imprint and transfer of the drawing. The excess of the prepared mixture of the ceramic paint was rubbed off, so that the ink-paint remained only in the grooves of the plate, similarly as in the graphic intaglio techniques. Then, during the transfer process, an appropriate tissue paper moistened with a soap solution was evenly applied to a heated copper plate. The prepared plate with tissue paper was passed through a felt-covered press, which caused the ink to be imprinted onto the tissue paper, after which the plate was placed back on the cooker in order to safely remove it from the matrix. The paper with the reflected image (a mirror image) was

1 William Turner, *Transfer Printing on Enamels, Porcelain and Pottery*, London 1907.

successively placed on the ceramic, smoothed out of any wrinkles and then rubbed with stiff bristles to transfer the print onto the porcelain object. The object thus prepared was placed in a bath of cold water, and the tissue paper was removed without destroying the colour and image. The object was then fired for ten hours at 680-750°C so that the oil evaporated first. The ceramic object was then fired a second time at 1050°C so that the design turned blue. In pace with the development of the printing techniques, the methods of transferring the image onto ceramics have undergone numerous transformations.

Transfer used today and the problems associated with it

Nowadays, screen printing, or less commonly digital printing, is a commonly used printing system. In the screen printing technique, the printing form is a fine mesh stretched on a frame and covered with light-sensitive emulsion. Preparing it for printing consists in making a stencil, i.e. covering places that will not be printed. The photosensitive emulsion on the grid is exposed by contact in a copying machine. After development (rinsing of the unexposed emulsion) and drying, the screen with the stencil is ready for printing. The print is created by pressing the ink onto the substrate with a squeegee. In this process, an image - a stencil - is quickly made, often by preparing it in a computer. However, screen printing materials intended for ceramics (paints, mordants, varnishes) are highly toxic, therefore working on the transfer of graphics using this method is practically impossible in the conditions of an art workshop. One of the most important chemical liquids used in screen printing is the solvent. Solvents usually consist of a mixture of acetone (about 30%) and toluene (about 70%). Some manufacturers also use xylene, ethylbenzene, methyl acetate, ethyl acetate, various alcohols and other additives in its composition. Of those listed above, toluene is used in the greatest quantity and is very harmful. Its adverse effects include possible damage to the respiratory, circulatory, reproductive, nervous and immune systems, and especially to the nervous system, which consists largely of lipid-rich tissue in which toluene is soluble. Other harmful substances used in screen printing are flammable paraffin and turpentine.

Ceramic digital printing

The second commonly used method is digital printing with ceramic pigments. The tracing paper pattern is precisely prepared in a computer with specialised software and then, using a printer calibrated to a specific set of pigments, it is transferred to the object for future firing. The range of colours for printing from the CMYK colour palette offers a wide range of possibilities. It is all the

more interesting for the artist because it is possible to work with colours that have been tested to avoid mistakes after firing (95% colour conformity after firing). The process of transfer of the image by means of a digital printer, as well as the printing from the matrix, is almost non-toxic. The preparation process is fast due to the different parameters. It is a very effective tool, providing an abundance of effects and very high predictability of the colours used in the final result. However, digital printers with ceramic pigments are almost unavailable for artistic research because they are not common and the services involved are very expensive.

The properties of transfer from the metal matrix

Preliminary experience shows that the transfer of graphics – an image from a graphic matrix to ceramics is not only possible, but produces interesting artistic effects without the use of toxic solvents. One of the most important differences in the transfer of digital print in relation to transfer of screen printing is that digital print transfers have a range of tones. With one quick print, a gradation of colour can be achieved, whereas with screen printing this effect requires superimposition of multiple images. At the same time, the colours applied by screen or digital printing are different and have both their limitations and unique qualities. The idea of researching and developing this classical process and implementing it into the conditions of contemporary graphic art can broaden the range of methods available to artistic printmaking today. At the same time, this method offers many possibilities of creating structures and matters resulting from the nature and essence of the graphic matrix. For example, the deep lines of an etching can be felt on the surface of porcelain even after it has been fired in a ceramic kiln. Classical transfer, which refers to the tradition of the 18th century in our research, is based on acquisition of image using classical printmaking techniques. Both the preparation of matrices (using solutions from various intaglio techniques) and the method of transfer onto ceramics itself - using various types of papers, carbon paper and tissue papers - have been analysed and adapted to the present state of knowledge.

Intaglio techniques

In intaglio printing techniques, the ink is rubbed into grooved or etched areas which are concave in relation to the surface of the plate. The drawing is worked with engraving needles, scrapers and roulettes. The print is made on rice paper and carbon paper using a printing press. The first prints printed from engraved metal plates appeared in Europe in the middle of the 15th century. Alongside the widespread intaglio and copperplate, which offered the possibility of large print runs, the dry needle technique developed at the same time - the drypoint, similar in its character to copperplate. A

drawing in this method is made on a prepared metal matrix. For studies, we use zinc sheets and aluminium sheets because of their different qualities. By appropriate handling of the line, tonal transitions from very subtle delicate greys to deep blacks can be obtained in this technique.

The next technique tested is etching (Latin: *aquafortis* - strong water) - an etching technique invented at the turn of the 15th and 16th centuries. A line drawing on a prepared - covered with asphalt - surface of a metal plate is subjected to etching. The technique makes it possible to obtain a very diverse linear drawing by means of etching. The aquafortis etching method seems to be the most optimal technique to be used for transfer. The etching process will use nitric acid, ferric chloride and sodium chloride sulphate. The most eco-friendly method is to use ferric chloride and sodium chloride sulphate. Ferric chloride at 45 degrees Baume will be used to etch copper plate, while sodium chloride sulphate in a solution of 75 g per litre of water will be used to etch aluminium. The etching for zinc in nitric acid will be carried out in a solution, with a water-to-acid concentration of 7:1 (after the bath, the solution will be neutralised with baking soda).

Attempts at testing graphic transfer substrates will also include the technique of aquatint (Italian: *aquatinta*, coloured water). Aquatint was invented in 1768 by Jean-Baptiste Le Prince. A metal plate is sprinkled with powdered rosin and then heated, so that the rosin grains melt and stick to the metal surface (rosin is a natural resin from coniferous trees - the composition of rosin is 90% a mixture of two isomeric resin acids). This creates a kind of raster which protects the surface of the plate from the operation of nitric acid. The technique makes it possible to obtain valour-differentiated planes by means of etching.

In relief printing methods

The next research will cover a relief printing technique: the linocut, whose name comes from the matrix, linoleum, invented in 1863 and very quickly used by artists. In this method, the ink is applied from a roller to the surface of the matrix, blackening the convex areas that are not grooved, while the lines and concave planes remain white. The drawing is cut out with chisels and knives. However, the effect of this method is different from intaglio techniques. The gradation of greys is a consequence of the intensity of the cut out white lines and points, which create tonal transitions from black to light greys. The method of reflection means that the print is devoid of graphic matter, but has a characteristic relief.

Studies related to ceramic paints

A very important element in the implementation of the method of transferring graphics onto ceramics is the development of the formulas for contemporary low-toxic or non-toxic ceramic paints in a basic range of colours for ceramics, porcelain, glass. The pigments, fillers and fixatives we are testing are to form a set of materials for the graphic methods of transfer. An effective method of transferring a graphic image onto ceramic substrates requires the implementation of tests and studies in order to establish formulas, reagents and technological processes; it also requires examination and description of the carriers of the image to be transferred: starting from the intaglio to the relief printing matrices; development of formulas for the composition of graphic-ceramic paints, firing methods, ways of applying the image, and papers used. Due to the range of physical parameters of the phenomenon studied, the dyes created and tested can be examined spectroscopically.

Spectroscopic studies on baked pigments

Spectroscopy is used in analytical chemistry for the quantitative determination of various organic compounds. Chemical quantitative analysis makes it possible to find out the numerical value in appropriate units of measure (for example in grams or moles) of the chemical composition of the dye mixtures being tested. There are many specific methods of quantitative analysis used depending on the chemical properties of the substances under study. In this study, the colouring matters used will be subjected to the quantitative and qualitative chemical analysis. The aim is to determine the composition of paints or fillers (the percentage of individual components in the mixture of the selected component – the quantitative analysis, and to determine what components the substance consists of – the qualitative analysis). Spectroscopy, as a method involving the generation and interpretation of the spectra (which are popular in the chemical analysis of the composition) of paint intensities is the best method for describing the dyes we test.

Contemporary application in Poland

Currently in Poland, the issue of transferring graphics onto ceramics from an artistic point of view is dealt with mainly by Małgorzata Warlikowska, PhD, at the Faculty of Graphics and Media Art of the Academy of Fine Arts in Wrocław, who conducts classes on transferring graphics onto ceramics using screen printing. The screen printing technique is also used in industrial settings, for example at the Ćmielów Design Studio headed by Marek Cecała. However, when a project requires only a small

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Kimba Frances Kerner, "See the Red Sol"
Installation from the cycle "Alchemical Transformations"



Source: Author's archive

number of prints, the whole process of screen printing becomes very inconvenient. Many projects do not require a large number of prints, especially when they are used for smaller sculptures or conceptual works. In addition, this technique is burdened with high toxicity, which is a serious disadvantage in an art workshop setting. The classical transfer technique, on the other hand, minimises the burden to only a few prints, which is why the proposed classical method, updated for contemporary use by artists, seems extremely useful in the creative process.

Porcelain, glaze, ceramic printing and mixed techniques, 2020



Source: Author's archive

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