CHAPTER «HISTORY OF ART»

AUTHOR'S TECHNOLOGY OF THE MAKING A MODERN ICON BASED ON THE EUROPEAN PAINTING TECHNIQUES

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Abstract. *The purpose of the study* pertains to the technology and techniques of ancient and modern icon painting. In particular, their principal processes that are presented on the basis of the author's experience and practical application tested by the well-known scientists-fine art experts. *Methodology*. The study was conducted using a complex of methods, such as historical, comparative, typological, analysis and generalizations, descriptive, visual, technological (chemical properties and physico-chemical processes); documentary (official and unofficial recorded information, books, manuscripts, etc.); artistic and stylistic (analysis of the manner of individual masters, their schools, separate fine arts periods); philosophical (metaphysical method: essence and phenomenon; substance and form); theological (church canons; divinity of the icon); method of artistic analysis. *Research results.* A unique author's technology of producing icons was developed and described on the basis of the study of the best methods of ancient and modern technological processes. This technology has been tested by the well-known students of the sacred art. *Scientific novelty* of the obtained results is that valuable materials dealing with the use of the ancient techniques and technological processes in modern sacred art have been contributed to the Ukrainian fine arts science, particularly, icon painting using the ancient egg-tempera techniques (taking into account the author's experience). *Recommendations*. The study of the ancient techniques and technological processes and their application in contemporary painting still require further theoretical research.

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1. Introduction

Creation of any art works of sacred designation requires professional knowledge and skills that are impossible without a thorough knowledge of the technology and techniques. To a large extent this applies to the technology of making icons, which is exceptionally important given its intended function. An icon is a work of art that has not only artistic and aesthetic value, but spiritual value as well. It visually reproduces the main truths of the Christian faith based on the Bible (the Holy Scriptures of the Old and New Testaments) and the Liturgy. The world-known miracle-making icons arouse interest of students of the sacred art not only by their unique iconography, artistic style, but also by the technology of their execution. Note that the ancient technique based on egg yolk emulsion is traditionally used in canonical icon-painting, and painting is made by applying thin layers of paint using the scumbling method.

The purpose of the study. The purpose of the research is to study technology and techniques of icon painting, particularly, the main processes and their practical application.

The object of the study. The object of the study is the ancient and contemporary techniques and technology, as well as the author's (thirty-year-long) experience in creating icons.

Methodology of the study. The study was conducted using a complex of methods, such as historical, comparative, typological, analysis and generalizations, descriptive, visual, technological (chemical properties and physico-chemical processes); documentary (official and unofficial recorded information, books, manuscripts, etc.); artistic and stylistic (analysis of the manner of individual masters, their schools, separate fine arts periods); philosophical (metaphysical method: essence and phenomenon; substance and form); theological (church canons; divinity of the icon); method of artistic analysis.

Analysis of recent publications. The techniques and technology of icon painting of the Christian era are described in the treatises of the monk Eraclius "On the paints and art of the Romans" ("De coloribus et artibus romanorum") of the 10th century; "Notes on various arts" ("Diversarum artium schedula") by the monk, known as Theophilus Presbyter of the 10-11th centuries (one part of this treatise is devoted to painting); "Treatise on Painting" by Italian painter Cennino Cennini, written in 1437 [1];

“Treatise on the technique of painting” by Giorgio Vasari, who presented the “Introduction” (“Introduzione”) to his famous historical work “Lives of the Most Excellent Painters, Sculptors, and Architects”, written in 1550 (reprinted in 1568). Unabridged edition in one volume (Moscow, 2008) [23]; a treatise by the Italian painter Giovanni Armenini "On the True Precepts of the Art of Painting" (Giovanni Battista Armenini, “De ‘veri precetti della pittura” Ravenna, 1586); the treatises of the Milanese artist Giovanni Paolo Lomazza ("Treatise on the Art of Painting" (Giovanni Paolo Lomazzo, “Trattato dell'arte della pittura”, Milan, 1584) and “The Idea of the Temple of Painting" (“Idea del Tempio della pittura”, Milan, 1590) describe history and practice of painting. “Treatise on the Art of Painting” of Lomazzo’s is a “connecting link” between the theoretical treatise of Zuccari and the practical treatise of Armenini, where the author describes in detail the mannerist art in its theory and practice [11, p. 274]; “The Book of Painters” by Carel van Mander (first edition – Alkmaar, 1604, second revised edition – Amsterdam, 1618. The treatise consisted of six parts, one of which was devoted to the iconography of ancient art. This book was published in 1940 in Moscow in the Russian language, translated by V. Minorsky) [11, p. 366]; “The Wonders of Art” (“Delle meraviglie dell’arte”, 1648) – a historical work of the Venetian painter Ridolfi, that included biographies of the famous Venetian artists; Manuscript of Theodore de Mayerne (1573–1655) – court physician of the King Charles I of England, who was interested in the techniques of painting, in the solution of which he took an active part; “Hermeneia, or teaching in the art of painting” by Dionysius of Fourna (Phurnagraphiot) [4] and others.

In the study of technology of different types of painting there were taken into account the works of the Russian researchers, in particular, Dmitry Kiplik’s “Painting Technique” (Moscow, 1950) [8]; Maria Sokolova (nun Juliania) “The work of the icon-painter” (Moscow, 1998) [13]. The works of the Ukrainian scientists were also the subject of the in-depth analysis, first of all those that described technology of the egg tempera painting. These include the book by the Ukrainian author Petro Omelchenko “On Painter’s paints, materials and techniques” (Kharkiv, 1930, reprinted in Lviv in 1996), that consisted of six parts: optical phenomena and colors; chemical bases; materials used in painting techniques (…); dyes; painting techniques; techniques of monumental painting and the addendum that presented the

principles of gilding [12]. Of interest is the pre-war book by Kharkiv author Vasyl Lakhonko "Artistic Materials and Painting Techniques" (Kharkiv, 1938) [10] as well as related to the subject materials from the monograph of Mykhaylo Dragan "Ukrainian decorative carving of the 16-17th centuries" (Kyiv, 1970) [5].

Modern author's technique of icon painting is partly described in the monographs and publications on the art of Lev and Andriy Demyanchuk, such as "Lev and Andriy Demyanchuk: Sacred Art" (Lviv, 1997) by Ihor Holod, art history PhD, professor of Lviv Academy of Arts [7]; "The Art of Ukraine and the Diaspora: Sacred and Applied Woodcarving" by scientist-fine arts expert from Ivano-Frankivsk professor Bohdan Tymkiv, Doctor of Philosophy, (Ivano-Frankivsk, 2010) [21, p. 202–208] etc. [22]; "The New Renaissance: Icons of Andriy Demyanchuk" by famous Kyiv scientist, Doctor of Arts, Doctor of Theology, Doctor of Philosophy, Academician, Professor Dmytro Stepovyk (Kyiv, 2012) [19, p. 245–255] and others [14–18; 20].

2. Ancient technology of European painting

Knowledge of painting techniques gives the artist the opportunity not only to create the long-lived works, but also the best way to use painting materials. Modern painting techniques are based on physics, chemistry, technology of paints and binders. The ancient technique of painting also used scientific knowledge and experience of the leading masters, passed down from generation to generation. This knowledge created a strong theoretical and practical basis of icon-painting technology, and the well-preserved works of the past centuries provide a convincing proof of this [3, p. 17].

Icon painting uses the ancient technique based on egg emulsion. This is a unique phenomenon in which linkage of molecules of water and linseed oil takes place with the aid of egg yolk to form an emulsion. Pigments are added to this emulsion to produce the egg-tempera paints. Painting is performed by the method of filling which means applying thin layers of paint on the icon, as applying of thick layers leads to the formation of craquelures. This technique was widely used in the 13th century, and the icon-painters used earth colors, adding to the color palette new elements and discovering new properties of the existing colors. There are three colors that should be considered as the main colors: red, blue and yellow. By mixing

them one can get purple, orange, green colors. In the painting technique such method of applying paint on paint is called “scumbling”.

The technology of different types of painting was described in detail by professor of St. Petersburg Academy of Arts Dmitry Kiplik in his book “Painting Technique” [8, p. 131]. He and his students created a great number of works using egg tempera based on the whole egg in easel and monumental painting. We learn about tempera, its composition and properties from the very word "tempera", which comes from the Latin “temperare” – “blend”. In the 15-16th centuries in Italy it meant the binding material of paints in general and, in particular, glue of animal and plant origin. In modern Italy, tempera is often given a narrower meaning: a binding material that contains egg. In scientific literature on painting techniques tempera is commonly referred to as the binding material consisting of a natural or artificial emulsion. Before the improvement of the oil paints of Jan van Eyck (15th century), the medieval egg tempera was one of the most popular and widespread types of painting in Europe. But, starting from that time, it began to gradually lose its importance. The only exceptions from this are the countries with the existing tradition of icon-painting.

In the second half of the 19th century disenchantment with oil painting brought with it searches for the new binding materials for paints. The forgotten tempera of the well-preserved works that speaks volumes for itself, revives again. Adhesive properties of the egg are so evident that the idea of using the egg as a binding material in painting had to be conceived a long-long time ago. One of the oldest recorded documents, which is the “Natural History” of Pliny, describing the paint “purpu-rissum”, tells us that it was mixed with egg yolk for the use in art. It is believed that the ancient Egyptians used egg emulsion for decoration and art painting. Egg tempera fully met the demands of the medieval art and was used to improve oil paints. The use of egg emulsion in icon-painting has survived to this day since adoption of Christianity in Kievan Rus [8, p. 129].

The most outstanding Italian masters who painted with tempera on wood and on the walls are: Cimabue, Giotto, Orcagna, Mantegna, Taddeo and Angelo Gaddi, Spinello Aretino, Masaccio, Beato Angelico, Filippo Luccio, Ghirlandaio, Benozzo Gozzoli, Sandro Botticelli and Luca Signorelli. Among the Greek painters there is the well-known Manuel Panselinos, called "Giotto of the Byzantine school" and others [8, p. 130].

Cennino Cennini, the Italian painter of the 15th century, in his treatise on painting of 1437 described two types of the ancient egg tempera. The first was when some tips of branches cut off from the sycamore (fig tree) were added to the egg yolk and egg white, after which it was all thoroughly ground. Then about half the volume of this mixture wine diluted with water was poured into this mixture. The emulsion prepared in such a way was added to dry pigments of paints. Chennini describes the other tempera as well, which contained egg yolk and was used for murals, for painting on wood and iron [1]. Aside from the egg this tempera always contained the preservative agent – milk sap of the fig tree, as can be seen from the treatises of Vasari [23] and other authors.

Cennino Cennini's treatise on painting describes with sufficient detail tempera of that time, when this technique was in the state of its highest development. The treatise is full of descriptions of the curious details of this method of painting determined by the precise knowledge of properties of the egg. It is interesting to note that the artist of Chennini's time was able to use to his advantage even one of the obvious faults of the egg yolk with its inherent yellow-orange color.

Thus, Chennini appoints the light-colored yolk of city hens for composing the light tones for painting female faces; strongly colored dark yolk of the village hens – for composing dark tones for painting dark-skinned images. The yolk, that already contains oil, can also emulsify it in proportion to its weight. The coloring agent of the yolk is non-persistent and fades away very quickly in daylight, while zinc white paint rubbed up with the egg yolk becomes pure white soon enough.

The oil contained in the yolk belongs to animal fats. In its pure form it slowly thickens in the air, becomes viscous and does not harden for a long time, it has little in common with the seed oil. Too much yolk introduced into paint causes formation of craquelures, because after the paint dries the protein parts of the yolk lose some more water, which results in further compression of the layer, and seemingly well dried paints containing excess yolk actually crack. Egg powder – the binding material of the ancient tempera – rapidly decays, especially in southern climate. To prevent this unwanted effect painters used to take appropriate measures: to achieve this in Italy they mixed into egg yolk some fig tree sap that partly diluted and, owing to its acid properties, promoted conservation of the yolk; for tempera

in Germany they used beer that contains plant gluten and a small percentage of alcohol. The Ukrainian icon-painters added to the yolk acidic fermented-bread kvass. According to the rules of the icon-painters of Kievan Rus, kvass was taken in such a quantity that the yolk and kvass filled the whole eggshell, that is, the amount of kvass was equal to the amount of the white of the egg. The proportion between paint and its binder was established, according to Cennino Cennini, in such a way that both were taken in equal amounts. Paints produced in this manner were diluted with water. The picture, painted in such a way, made subsequent pastose painting impossible. The painting consisted of thin layers. When drying, the painting lightened in tone and acquired a mat surface. Tempera on the egg yolk was intended for painting on wood, though it was also used for wall paintings, which was widely practiced in Ukraine.

Cennino Cennini describes the processes of tempera painting in chapters 145 and 147 of his treatise: “It is true that pictures are painted in the same manner as paintings in fresco, with three exceptions: one is, that you must always paint the draperies and buildings before the faces. The second is, that you must temper your colors properly with yolk of egg, always putting as much of the yolk as of the colors which you would temper with it. The third, that the colors must be ground very fine, like water (that is, to an impalpable powder) (…). Remember, that painting on wood requires a much cleaner primer than the wall painting, yet so that the green tint under the flesh-color should just be visible through it. When you have painted your flesh colors, and the face begins to look well, make a flesh-tint still lighter, and paint the prominent parts of the face, putting on the lights in the most delicate manner, until you touch the highest lights over the brows, and on the tip of the nose with a little pure white. Paint the outlines of the upper eyelids with black, also the lashes and the nostrils. Then take a little dark sinopia with a little black, and make the outlines of the nose, eyes, eyebrows, hair, hands, and feet, and generally of every part as I directed you when painting on walls, always tempering the colors with the yolk of an egg” [1, chapter 147]. So, this is the way that the pictures and icons were painted with tempera in Chennini's time and many centuries afterwards. Of interest was the optical effect of icon painting if done with the use of the white primer. On it, the reflected beams of light highlighted a little the underlying color tones.

Starting from the end of the 13th century the Greek and Italian masters used ultramarine and cinnabar. An example of this is the altarpiece icon "Maesta" by Duccio di Buoninsegna, painted in 1308–1311 for the Siena Cathedral (the icon is painted on the board on both sides; the front side showed the enthroned Holy Mother with the infant Jesus surrounded by saints and angels; he reverse side showed in its 26 compartments various dramatic episodes of the Passion of our Lord. Subsequently, the board was cut in two pieces, so that each side represented a separate picture). Ultramarine and cinnabar were also used in painting by the Ukrainian icon-painters in Volynia, Galicia, and Transnistria. Of great importance in the work of both, the master of Chennini's time and in the case of the Ukrainian icon-painters was varnish that covered the finished work. Varnish gave the tone to the whole work and the whitening touches applied with pure whites ("fine white lines round the eyes, forehead, nose, etc.") at the final strokes of the brush. The method of shading the form with the thin long strokes applied in different directions has also been cultivated in icon painting.

In icon painting there is a technical method of making the drawing with the help of a line cut into the primer, the so-called "graph", which was drawn in the primer with the aid of some sharp object (a spike, a needle). This graph, apparently, was borrowed by easel painting from the fresco monumental works where the drawing was cut into fresh stucco.

Easel painting, started with tempera, was not always finished with tempera. They often used oil paints to finish the painting. It was also practiced to mix egg paints with oil paints in the following way: the body was painted with tempera, and all the rest was painted with oil paints. This mixed method of painting has been practiced for a long time. Easel painting, made in tempera, was made so that the full effect in terms of coloration came out after a coat of varnish, under which the icon changed considerably, deepening in tone and acquiring a yellowish tint which was characteristic of medieval varnishes. The varnish not only fixed the paint and protected the work from any external influences, but also gave it a finished look. Transparent paints were mixed into the varnish.

Tempera covered with a layer of varnish was exposed to the sun to accelerate drying. Later, when technical knowledge became so advanced that it became possible to produce the quickly drying oils, these were often used as varnishes. However, oil boiled with the yellow lead blackens the

surface deeply – and this is especially noticeable with the ancient icons, because boiled linseed oil served for them, as a rule, as varnish. When fixing tempera with the boiled linseed oil ancient icon-painters, which is confirmed by the recorded documents, covered the finished icon with fish glue, and on top of it with boiled linseed oil (if covered with glue alone the icon blackened). But it is better to cover the painting with egg white without mixing it with anything else [8, p. 141].

Thus, before coating the tempera with boiled linseed oil, tempera was pre-coated with a solution of glue or the egg white. This method prevented the uneven distribution of boiled linseed oil in the tempera layer, hindering formation of stains in the painting and, besides, much too intense blackening of the boiled linseed oil. It was often practiced to cover the icon with a solution of glue alone, which can not be assumed as rational. Icon-painters of recent times covered their works with boiled linseed oil and treated them with the French polish (a solution of shellac in alcohol). Yet, as the time went by, boiled linseed oil was replaced by varnishes.

Here varnishes of various compositions could be used, including water varnishes. They are prepared in the following way: bleached shellac is dipped into a covered container with the strong ammonia liquid and kept there for 12 hours. After that time it turns into a gelatinous mass, which is then dissolved in hot water, forming a light varnish. According to Vibert's recipe, take 60 grams of white shellac and 10 grams of borax. Put it all into water and then put the mixture on the fire and slowly bring it to the boil. All shellac is completely dissolved. There is nothing special to say about the strength of the works painted with ancient tempera. A large number of such works, belonging to the brush of various masters of Europe, have survived till our time in the prime condition and, therefore, prove the strength of the yolk tempera.

Paintings by Italian masters, covered with varnish, acquired only a peculiar tone. The Greek and Russian icons, covered with pure boiled linseed oil (or in combination with varnish), sometimes disappear completely under the layer of blackened boiled linseed oil. Emulsion consisting of oil and egg was known already in the Middle Ages, but it was used only for medical and cosmetic purposes. There is also information that in the Middle Ages in Spain they used in painting an emulsion consisting of a solution of casein and oil. Vasari, speaking of tempera, reports that artist Baldovinetti painted

with tempera that consisted of egg yolk and oil varnish, but immediately added that tempera of this composition was not commonly used [8, p. 142].

The painting techniques of the Renaissance were to a great extent made possible thanks to the experience of Byzantine masters during the heyday of icon painting in Byzantium, especially in the period of iconoclasm in the 8-9th centuries, when the Greek masters, fleeing from persecution of the authorities to the north of the Byzantine Empire and to the south of Italy (particularly, fugitives from the island of Crete), took icons with them and continued painting in the new ethnic environment. This gave excellent examples of icon painting, where one can see the influences of both, East and West – a unique synthesis of art and philosophy of life. Golden background was employed in the icons, and painting was made predominantly with egg tempera. From the literature of that time, like the known manuscripts of Lucca, Eraclius and other authors we learn, among other things, about the materials and techniques of the icon-painters of that time. Glue primers were made of gypsum; glue, wax, egg and honey were used for the emulsion. Painting was made on the primed boards and canvas. Boiled linseed oil was used to cover the painting [3, p. 135].

3. Author's experience in creation of icon. Principal technological processes

An extremely valuable gift for the contemporary icon-painter is the preserved writings on the materials and techniques of icon and monumental painting. From the study of these ancient works on the painting techniques it becomes clear that they are a great asset for painters of the 21st century. However, the materials and techniques of our predecessors still differ from the modern materials and techniques in many ways. This is explained by the fact that the quantity and quality of painting materials at that time were rather quite limited. Thus, painters of the past centuries (early 17th – late 18th centuries) did not know about zinc white, cobalt blue, emerald green, etc., and used lead white, copper paints (malachite, copper frit), plant varnishes, that are rather short-lived. However, the advantages of their technical means were in that, that painters prepared their own paints and had a vast experience in this [10, p. 183–184; 11, p. 287–289]. They learned this craft in their early age, undergoing practical training grinding the dry pigments and making emulsions of different compositions and studying

other sciences such as philosophy, history, physics, chemistry, mathematics, medicine (meaning human anatomy), natural science, biology and astrology [3, p. 134].

The author's experience in creation of icons is based on the knowledge of technology of ancient and contemporary icon painting. Although the process of creation of a particular icon has its own particularities, in general it is similar to the process of creation of other icons. The icon consists of a certain number of consecutive layers. *The first layer* (the base of the icon) is a wooden board made of solid wood, preferably hardwood; *the second layer* – a linen canvas glued onto the board; *the third layer* is the primer, levkas, made of chalk powder with glue and boiled linseed oil, onto which the drawing is transferred; *the fourth layer* – application of several layers of alcohol varnish and polishing, carving of haloes and the background of the icon; *the fifth layer* – application of several layers of oil varnish and gilding process; *the sixth layer* – icon painting, using natural dyes-pigments prepared on the natural egg emulsion; *the seventh layer* – laying flax-seed oil varnish or varnishing, which protects the icon from external influences.

Thus, the entire work on the icon was divided into a chain of successive actions: selection and primary treatment of wood; woodwork; icon frame carving; varnishing of the frame; gluing canvas; coating with primer; drawing and transfer of pattern; applying alcohol varnish and polishing; carving of haloes and the icon background; applying alcohol varnish and polishing; applying oil varnish; pre-filling; icon gilding; painting with egg tempera based on pigments; fixing with varnish.

Then, in accordance with the list, let us start with the selection and primary treatment of wood. Durable and strong species of wood were used for icons. However, each country or region has its own specific species of wood. In the Orient, icons were traditionally made of cedar wood (well-known is the cedar of Lebanon whose wood, according to legend, was used to make the cross on which Jesus Christ died). Later on linden tree wood was widely used – starting from the late 14th century till present day. This is explained by the low cost of the material itself and the ease of its treatment and carving, however, fit-for-the-purpose and sound is the board made of hard wood. In Ukraine these are wooden boards made of oak and beech trees, for smaller icons – maple, pear-tree, for icons without carving – larch. Wood was used in the form of one-piece or glued boards. Wood had

to be dry, without knots. However, even fully seasoned wood is prone to warping and cracking under unfavorable conditions. Thus, an oak board is considered completely dry if it was drying during 15–20 years with its thickness of 7–10 centimeters, or drying during 10 years with its thickness of 3–6 centimeters [19, p. 249].

The process of preparation of wood for icons is quite complicated. There are many ways of such preparation. One of them is described in Maria Sokolova's book "The work of the icon-painter" [13, p. 46–52]. In ancient times, wood was dried in the open air and for a very long time. To prevent warping of the board made of several glued pieces, on the back side, across the wood fiber, there were cut out slots into which special wooden slats were inserted, made in the shape of the slot of harder wood than the board itself, for example, of oak wood. The shape of the slot in which they are inserted is called the "dovetail". The slats must not be glued to the board. Then on the front side of the board there is made a flat depression, around which the framing remains intact. This part of the board is called "the ark" [3, p. 81–86].

The second stage of creating icons is woodwork. Preparation of the board for priming was as follows. If the board was very smooth, the surface was roughened on the front side with the help of a special tool – cabinet scraper. It is similar to an ordinary carpenter's plane, but its blade has small notches. Working on the board with such tool eliminated smoothness of its surface. This was done in order to ensure stronger adhesion of canvas and primer. Deep indents on the board and knot holes are repaired by glueing in well-fitted pieces of wood or filling with a mass of glue mixed with sifted sawdust. If the new board had knots on the front surface (that are often found in cypress boards) they were removed and the knot holes were filled with pieces of wood on glue.

Further treatment of the board for coating with levkas requires, first of all, glue. Usually they used carpenter's hide glue, which was the most resistant to weathering. Hide glue was known in ancient times: the Egyptians used this glue about five thousand years ago [6, p. 40–47]. The best grade of this glue has great viscosity and elasticity; besides, it is almost colorless. The use of this glue, especially for primers, required care, because its high adhesive strength in case of improper handling facilitates the formation of cracks in the primer [13, p. 225]. Sometimes plant gelatin was used instead

of this glue. However, its adhesive strength is inferior in comparison with the best grade of hide glue.

The next step was glueing the canvas, before which the wooden board was fully sized with hide glue. Methods of preparation of this glue boiled down, mainly, to grinding the flakes of fish or rabbit glue and placing it into cold water for about a day. Then container with the bloated glue was put into a special vessel called the "gluepot". A gluepot consists of two vessels put one into the other. The larger vessel is filled with water and put directly on the fire, and the smaller vessel is filled with the glue solution. In the larger vessel wooden planks are placed under the bottom of the smaller vessel with a gap in two intersecting rows connected with wooden pegs. This gap at the bottom of the vessel is always filled with water. Glue in the vessel is heated over a low fire so that it does not boil, because it loses its adhesive strength if overheated. This method of preparing glue is called boiling in the water bath. Then glue is poured into another vessel and diluted with hot water. It was applied very hot on the front surface of the board. After sizing, the board was well dried. Drying time sometimes lasted from several hours up to a day, depending on the temperature and humidity in the room where the work was done. Next, a strong linen cloth was glued onto the board, prepared in such manner. The same glue as before was used for gluing the cloth. It is suitable for the highest quality wood [3, p. 90].

After the canvas was glued and dried the icon was *coated with levkas*. The component parts of levkas (from the Greek λευκός – white ground – the base for paint or gilding) were: finely ground white chalk, glue made of fish bones or rabbit skins and natural boiled linseed oil, that the icon-painters prepared themselves. Lead products were added to the boiled linseed oil, much later – products of cobalt or manganese, and boiled for a long time on a low heat in the water bath, adding also a few drops of glycerin, holy oil and holy water. There are proven ways to prepare glue for the primer. They are also described in the Hermeneia [4, part 1, paragraph 4]. To prepare the glue primer they usually took one part of glue; five parts of water; ten parts of wet finely ground chalk; 25 grams of glue are required for one square meter of the canvas. The canvas was primed with chalk and glue. A low thread count canvas required a denser primer. A good primer for such a canvas must not be loose, and when rubbing it with the palm of the hand it must not leave any trace of chalk on the hand; when bending it must not break; thus, it must

not contain too much glue. The primer of such composition was applied with a scraper or brush. By reducing quantity of chalk, you get a denser primer. Sometimes, to make glue more elastic, glycerin or boiled linseed oil was added. At the first drying, thin layers of levkas were applied – from 15 to 25 times. And each time the thickened layer was smoothed out with a spatula and natural pumice. The final cleaning of the hardened levkas was made with a sleeker – a steel blade that produced an ideally smooth surface [3, p. 92].

The next step was to create a *composition and transfer the drawing*. This is where the true creative work began – creation of the composition. This process was started mostly in advance, but most often there were used already prepared compositions-models as well as new patterns. Then the drawing was transferred onto the levkas. Usually the outline of the icon was drawn not on the levkas, because it could be damaged in this way, but on the parchment [4, part 1, paragraph 1].

After the drawing was transferred onto the levkas, *applying alcohol varnish and polishing* began. To do this, the surface of levkas was covered with alcohol varnish (shellac). Varnish filtered through and dried in 5–10 minutes (complete drying in 1–2 hours). Once the varnish dried, polishing was started – smoothing the surface with a special swab adding the same shellac. This is not done at once, but with long intervals of several days. As the general rule, repeated polishing of several icons in a row is made, moving from one icon to another. In the ideal case polishing continues 2–3 weeks, for shellac dries relatively slowly, and it must be firmly hardened. If polishing was successful, the surface of the future icon has a light yellow color and shines like glass. To ensure the lightest color of levkas prepared for painting, only the light shellac has to be used, for if it is dark, this can later affect the tone of the entire image, and the icon will not be bright, but somewhat darkish. Polishing was made only by the experienced masters, so this procedure was not always used in the creation of the icon.

At this point they started carving of the haloes and the background of the icon that after gilding had to glitter in the light of the sunrays or candles. To make it, levkas was slightly carved so that the background and haloes would be ornamented. For this purpose they employed various ornamental plant motifs. Such Renaissance ornaments in the background of the Ukrainian

icons are presented by Mykhaylo Dragan in his books [5]. There is also another method of creating haloes in the icon, which is laying on primer instead of carving [4, part 1, paragraph 7].

To fix the carved parts of the icon, the previous procedure was repeated – *applying alcohol varnish and polishing*. The ornamented background was again covered with shellac with aid of a flat kolinsky sable-hair brush-spatula, making sure that there were no blank spaces and the varnish was evenly applied onto the icon surface. Then, using a special sleeker – a metal blade made of hardened steel that may have the straight and various rounded shapes and sizes – it was slightly drawn through the varnished surface. This was done to remove extra grains and uneven spots on the surface. Then the flattened, smooth and even surface was wiped with a linen cloth and finally polished with a special swab, adding a few drops of linseed oil. Interesting is the fact, that students of Kosiv Art School were not allowed to use linseed oil when polishing with shellac. This was done in order to teach future professionals perfect mastery of artistic craft [3, p. 105]. Such polishing could not be interrupted and it was also not wise to polish in one spot for a long time since shellac could burn the surface. Here sequence of operations was used: several icons were polished one after another.

When the polishing became dry enough, they proceeded to the next operation – *applying oil varnish*, which was called mordant. This varnish was made by the method of boiling linseed oil adding yellow lead and turpentine (contemporary icon-painters most often employ ready-made varnish for guilding called mixtion, whose drying time may vary depending on the needs of the guilder and varies from 1 to 36 hours). The surface was thoroughly coated with varnish preheated in a "waterbath" (this is a vessel half filled with water, into which a smaller vessel with gilding varnish is placed). This container with water was heated to the boiling point, but the oil varnish when using this method could never be allowed to boil. Then hot varnish was brushed on with the aid of the kolinsky sable-hair brush-spatula on the icon and rubbed up with a swab. The same swab was used to remove varnish from the grooves of the carving and, when necessary, rub the smooth surface. Oil varnish was applied at least two or three times, each time after drying. The places on the icon, that were not to be gilded, were covered with a thin layer of paint made on the egg emulsion. This paint, most often, was of light-flesh color, known as dark underpaint.

Before gilding the open parts of flesh in icons, that is, the face, hands and feet, are covered with a thin layer of light-flesh color; clothes – with the corresponding color, the so-called colored lining, coloring. In some cases this could be the same color, but less intense or chromatic – the opposite color. This is done to intensify or degrade color and to achieve the corresponding tone [3, p. 106].

When everything was dry, the *gilding process* began. This very important process was executed according to the classical pattern, but using tools made with one's own hands: double-sided knives with rounded tips for cutting the very thin gold leaves; several rabbit's foot (the so-called lampenzels) for gilding; leather suede pad (30 x 16 cm) for transferring gold leaves onto the varnished surface of the icon; a set of kolinsky sable-hair brushes (spatulas) of different sizes for the final smoothing of the gold-covered icon surface.

Oil gilding is ancient and weatherproof. This is the most complicated, but often used, operation by its technique. Golden leaves were glued to the oil varnish called mordant. This method is sometimes called "tack-free" gilding, because the leaf was applied while the varnished surface still preserved its adhesive properties, that is, gold leaves were placed onto the surface with the aid of the squirrel's foot after 3–12 hours.

To transfer the thin gold leaves onto the icon, a small quantity of glycerin or ordinary cow milk butter is smeared on the back of the hand. Then, after touching it with the hair of the squirrel foot, gold leaves are picked up from the suede pad. If necessary, gold leaves were cut with the knife to the required size and carefully placed in the right place of the icon. When a piece of gold leaf was laid in its place, it was pressed down and smoothened with the aid of the kolinsky sable-hair brush-spatula. Gold, placed in the deep spots of the relief, was worked on with a soft round kolinsky sable-hair brush. Gold leaves, cut into strips with a special gilding knife, are called strophes. After laying gold and finishing its treatment with the brush, the remainder of gold was removed. If it was necessary to tint gold, it was usually covered with alcohol or turpentine varnishes, tinted with a particular dye. Such was the full-scale process of gilding icons [3 p. 115–116].

There are also other methods and ways of gilding, such as polyment or glue gilding [3, p. 108; 4, part 1, paragraph 10] and simplified methods of gilding on garlic juice, that in the ancient times was often used by the Ukrainian icon-painters [3, p. 116; 1, chapter 151–153].

Then we move on to the last but one operation of icon making – *painting with egg tempera and pigments*, as it was done in the ancient times. Egg emulsion is a solvent for the dry powder paints, which was prepared according to a recipe. Egg emulsion was made of the egg's main part – the yolk of the hen's egg without the slightest admixture of the white of the egg and the embryo cells removed from it – that was placed into a glazed ceramic cup. Depending on the volume of the yolk, one third its volume of the oil varnish-mordant of own production was added whose drying time was 24–36 hours. The yolk and varnish were thoroughly mixed with specially selected bristle brushes (of good quality). When the volume of this mixture doubled, a few drops of garlic juice, 1/4 part of dry white wine, and 1/2 part of holy water of the total volume of mixture were added [3, p. 119–120].

There is another tested method of preparing the emulsion. This emulsion is made of the egg yolk, adding to it oil-varnish mixture prepared in advance and consisting of linseed oil – 1/2 of the volume of the yolk; mordant oil varnish (for 24–36 hours) – 1/2 of the volume; oil dammar varnish – 1/4 of the volume; oil megilp varnish – 1/4 of the volume; galipot – 1/8 of the volume; turpentine – 1/8 of the volume; holy oil – a few drops. This mixture was thoroughly mixed and added in the proportion of 1/2 to the yolk, stirring it slowly with a brush. Quantity of this mixture was always smaller or equal to the volume of the yolk, but never greater, because the yolk has the ability to emulsify the quantity of oil that is equal to its volume, and never more than that. It emulsifies even less varnish [3, p. 120].

In practice, the less oily tempera was easier to correct by diluting emulsion with water and covering with it the weakly-fixed places on the icon. This mixture was then added to the yolk and ground with a brush so as to avoid formation of foam. After grinding the emulsion a few drops of garlic juice, 1/4 part of dry white wine and 1/2 holy water of the total volume were added to it. Sometimes one percent of garlic juice, dry white wine and holy water instead of wine vinegar in the proportion equal to the volume of the white of the egg were added for conservation of the egg emulsion. The rule is to always take that in equal, but not in lesser volume than the volume of the yolk. This way a thick mixture was formed, that the painters called egg tempera. Dry pigments of paints were dissolved in it, each color separately in separate vessels.

Thereafter they prepared a dark underpaint – the "flesh color", which was prepared in three tints. To these color tints they added green, made by way of mechanical mixing yellow and blue colors. Brown, magenta and violet colors were obtained by the similar method of mixing. Brown – by mixing green and red or black and red, magenta – by mixing red and black, violet – by mixing red and blue. The light or dark tints were obtained by adding achromatic colors: black and white, or chromatic – by adding yellow, red and blue. The mandatory condition here was a limited use and mixing of no more than three colors. That is, two or three chromatic colors with the adding of small quantities of achromatic colors.

In icon painting, optical mixing was often used instead of mechanical mixing, which was achieved by way of multiple applying of thin successive layers of paint. It was widely used in Byzantine and medieval painting [3, p. 122].

It should be noted that the icon is painted in a different consecutive order than the portrait. At first there are painted the so-called robes, that is, vestments with all the folds, gold hatching, ornamental decorations, and then the face and the hands. It should be said here that gold hatching on the robes of the Mother of God and Jesus Christ is gilded together with the haloes and the background of the icon, and not overlaid on top

The icon on wood was painted on a special horizontal table resembling a drawing table. On the right, closer to the right hand, there was a set of kolinsky sable-hair brushes. There, in the same area, there was a ceramic palette and various paints that were kept in a cool and darkened place. Their quantity was limited to what was needed, and they had to be of good quality (finely ground).

They were always arranged individually, but most often they were located in the classical manner, from light to dark colors. A long time ago a small number of paints-pigments were used. Today, this array of colors is considerably richer and continuously growing. Now let us consider the paints-pigments required for icon painting. White paints: zinc or titanium, that replaced the older white lead; ocher: light and red; siennas: natural and burnt; burnt umber; blue cobalt; ultramarine; emerald green; cadmium: cadmium lemon, tea rose, light red, dark red, magenta; cerise paint; black: burnt or ivory; flesh-colored paints from light-flesh to dark-flesh tints, known in icon painting as underpaints; three or four tints are enough [3, p. 123–124].

Let us consider now such a method of icon painting as filling. After mixing the paints they were applied onto the prepared drawing. The fillings were both, thin and thicker. It so happened that to achieve the desired color, tone, halftone, tint, up to a hundred or more fillings were made, each time allowing the preceding filling to dry. This most often applied to painting faces. Each subsequent filling dried faster as it combined with the previous filling. This method is somewhat similar to painting with watercolors. In both cases it was not allowed to mix paints of more than three tints, because otherwise there appeared the so-called "dirty color" [3, p. 124].

The method of filling in painting enriched and refined the color range of the icon. Repeated filling of the emulsion protected the painting from cracks, for paints were not mixed directly on the palette, but were applied onto the preceding layer, that had to be completely dry.

When painting faces of the saints, the most critical part of the creative work was and still is painting of the eyes. We learn from the diary of St. Faustina Kowalska [9, p. 313] that not everything worked out well with the icon-painters in the past. This is why when painting separate figures of saints or genre compositions, it is necessary to follow the plots taken from the books of the Holy Scriptures and the Lives of the Saints.

4. Assessment and practical application

This research is based on the theoretical study of ancient and contemporary techniques and technology of icon painting, as well as on the practical author's experience in creating icons. For three decades the author of this study gathered practical experience working with his father, Lev Demyanchuk, who received high professional art education and worked for many years in the field of sacred art. In the complex and lasting technological process Lev Demyanchuk used only valuable hardwood species using geometric and floral ornaments on the carved frames of icons. Lev and Andriy Demyanchuk have perfected their unique author's technology of making icons in which they successfully combined the ancient and modern technological methods (Figure 1).

Working at the post of the advisor on sacred art in Lviv Archdiocese of the Roman Catholic Church, the author of the study had a direct access to the opportunity to study sacred art, whose results were published in numerous scientific publications and in the exclusive monograph "How

Figure 1. Creative work of Lev and Andriy Demyanchuk (Lviv, 2008)

to create the Ukrainian icon: From the author's experience" (Kyiv, 2015) [3], and presented in the defense of the scientific work at the Specialized Council of Lviv National Academy of Arts, where the main results of the study were reported with the recommendation for their further publication. The presented techniques and technology of icon painting has been tested by the well-known scientists-fine art experts and researchers of sacred art [7; 14–18; 19, p. 245–255; 21, p. 202—208; 22]. The icons created with the use of this technology are displayed not only in Ukraine but also in the countries of Western and Eastern Europe, in Vatican, in the countries of the North and South America and in Japan.

5. Conclusions

Critical analysis of the technology and techniques of ancient icon painting and present day author's experience of icon creation has been made on the basis of the study of scientific works of the national and foreign scientists and masters of sacred art of different epochs. Having analyzed the ancient methods and techniques of sacred painting, it can therefore be concluded that the best and most appropriate should be regarded the techniques that use the ancient egg-tempera emulsion. The results of the

study are confirmed by the thirty-year long author's experience and by the works that are displayed in the temples, museums and private collections in many countries of the world.

Since the icon has not only a material but also a spiritual component, its blessing and consecration by the priest is important. And in the process of creation the masters must concentrate on the true spiritual Christian values based on the Holy Scriptures and the teachings of the Church of Christ.

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