# At the Origins of Giorgio de Chirico's Painting Formulas

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The most widespread approach to studies regarding the technical sources of painting is based on comparison between written text and contemporary literature of artistic technique, together with verification of the described materials in relation to any identified in the artworks through scientific investigation. This approach, which emerged over the course of the 19th century and was deeply consolidated throughout the 20th century, today elicits certain reflections concerning the typology of texts to be included in the aforementioned literature.

Following the industrialisation of painting material production processes, between the 18th and 19th centuries, there was a proliferation of technical manuals that dealt mainly with the description of new materials made available as a result of chemical research, which bore witness to the schism that had been created between artists and the materials of their trade: industrial production meant that the artist no longer knew their exact composition, properties and behaviour over time, since emphasis was mainly on the desired visual and expressive effect.

Synthetic pigments steadily replaced colours which painters, well aware of the merits, defects and incompatibilities of each one, had been using for centuries; whereas with synthetic pigments such knowledge was wholly approximate, all the more so since they were very often sold under their old traditional names.

William Holman Hunt's disconsolate observation that "In the old days the secrets belonged to the artist; now he is the first to be kept in ignorance of what he is using"[1], gives a pitiless picture of the situation of the modern painter who found himself quite disarmed with regard to colour manufacturers.

Industrial production of art materials, which from 1841-44 were sold in tin tubes instead of glass syringes or the original bladders[2], further accentuated competition among manufacturers who constantly flooded the market with new products – sometimes of exceedingly poor quality – and brought out old products with new names, giving rise to rather alarming terminological confusion.

[1] M. R. Katz, *William Holman Hunt and the Pre-Raphaelite technique*, in *Historical Painting techniques, materials and studio practice*, edited by A. Wallert, E. Hermens et al., The Getty Conservation Institute, Los Angeles 1995, pp. 158-165, esp. p. 160.
[2] A. Gioli, *Materiali industriali per la pittura dell'Ottocento*, in P. Bensi, A. Rava (editors), *Effetto Luce. Materiali, tecnica, conservazione della pittura italiana dell'Ottocento*, Edifir, Florence 2009, pp. 51-64.

One symptomatic example is the Veronese Green cited by de Chirico in the *Piccolo trattato di tecnica pittorica* (Small Treatise on Painting Technique)[3], which highlights both the fierce competition among manufacturers of art materials and the difficulties artists had in recognising the properties thereof: in fact it was produced in 1814 with the name *Verde di Schweinfurt* by von Mitis and described by Justus von Liebig as *verdigris* dissolved in vinegar with the addition of arsenic trioxide to obtain a copper acetate arsenite based compound. In 1822 it was marketed in Great Britain as Emerald Green, while in France it was sold as *Vert Veronese* to distinguish it from *Vert Emeraude*, obtained in 1859 by the chemist Guignet with hydrated chromium oxide, intensely green and very opaque, which in Great Britain took the name of Viridian. It thus came about that Italian artists could buy alternatively "Verde Veronese" or "Verde Smeraldo" without realising that they were two distinct pigments only in the case of French products, whereas the compound was the same if it belonged to the British brands Winsor & Newton, Roberson or Reeves, the oldest and most famous manufacturers.[4] Another case in point is Naples Yellow which, in its traditional formula dating to the 17th century, consisted of lead antimonate, whereas de Chirico states that it is a poisonous pigment consisting of arsenic, perhaps referring to orpiment which however was no longer used or produced at the time when the artist was writing.[5]

Faced with such a varied panorama strongly characterised by the mobility of the names of materials, it is indispensable to carefully evaluate testimony found in treatises and identifications proposed by scientific research reports. Whilst it is true that Italian artists generally purchased French products, this was not a systematic rule (as results from the study of Nino Costa's technique) and it is fundamentally important to carry out correct historical contextualisation.

Furthermore, all colour manufacturers employed their own confidential chemical consultants: there is documentation of Lefranc's relationship with Jehan-Georges Vibert, famous author of *La Science de la peinture* (1891, translated into Italian the following year by Gaetano Previati)[6], while Roberson dealt with Arthur Herbert Church, chemist of the Royal Society and author of *The Chemistry of Paints and Painting* (London, 1890).[7] Less well known is H. C. Standage, chemical consultant for the Reeves company, who authored numerous texts on pigment stability.[8] There was widespread publication of treatises and manuals such as those brought out in Paris by Roret – including the par-

[3] G. de Chirico, *Piccolo trattato di tecnica pittorica* (1928), edited by J. de Sanna, Scheiwiller, Milan 2001, p. 22.
[4] S. Rinaldi, *Colore e pittura. Teorie cromatiche e tecniche pittoriche dall'Impressionismo all'Astrattismo*, Aracne, Rome 2004.
[5] The Naples Yellow sold by Winsor & Newton contained yellow ochre and cadmium yellow (J.H. Townsend et al., *Later Nineteenth-century Pigments: evidence for additions and substitutions*, in "The Conservator", 1995, n. 19, pp. 65-78), while Moreau-Vauthier, referring to information received from Lefranc, maintains that it was then rarely used in France (C. Moreau-Vauthier, *Comment on peint aujourd'hui*, Floury, Paris 1923, p. 20). This very little known text by Moreau-Vauthier deserves more careful consideration, both because it is dated close to the *Piccolo trattato* and because the subdivision of the chapters is similar (*L'atelier; la palette; les véhicules; Les supports; L'éxecution; Le vernissage; L'aquarelle; Le Pastel; Autres procédés; Conclusion*).
[6] J.G. Vibert, *La science de la peinture*, Ollendorf, Paris 1891.
[7] A.H. Church, *The Chemistry of Paints and Painting*, Seeley Service & Co., London 1890.
[8] H.C. Standage, *The Artists' Manual of Pigments. Showing their Composition…*, Reeves & Sons, London 1883; Id., *The Artists' Manual of Pigments*, Crosby Lockwood and Co., London 1886; Id., *The Use and Abuse of Colours and Mediums in Oil Painting. A Handbook for Artists and Students*, Reeves & Sons, London 1892.
[9] J.R.D.A. Riffault, A.D. Vergnaud, C.J. Toussaint, *Fabricant de couleurs à l'huile et à l'eau, des laques, des couleurs fines, des couleurs hygiéniques*, Librarie encyclopédique de Roret, Paris 1884.

ticularly famous text by Riffault, Vergnaud and Toussaint on the manufacturing of colours (1874)[9] – which in Italy were sometimes translated and published by Ulrico Hoepli of Milan. Within this panorama the studies refer predominantly to French and English colour manufacturers – the ones chiefly investigated in international technical literature – but we must not neglect German production which, from the 19th century to the Second World War, was notable for both quantity and innovation in the field of art materials.

All these texts have been utilised to date as privileged sources for reconstructing the history of painting techniques. However, as well as highlighting the fact that with this approach history ends up being reductively understood as the history of materials manufacture and not of painting procedures, we must also underscore that great caution is needed when analyzing these texts. This is due to the fact that they represent the outcome of research carried out by colour manufacturers and have little to do with artists, and even less to do with how such materials were used.

The direct voice of the artists themselves is far more significant, and their testimony, even when largely aimed at making their own aesthetic and expressive objectives plain, is certainly to be favoured over contemporary manuals, revealing as it does a great amount of important information, above all on the procedures they followed, which gives a far better understanding of the substance of the executive technique employed.

From this viewpoint Giorgio de Chirico's *Piccolo trattato* is a source of prime importance as it was written by the artist himself concerning experiments that he carried out personally. It was first published in 1928 on the urging of Giovanni Scheiwiller, then editor of the "Hoepli Practical Manuals", a series of educational texts which had already included Giovanni Secco Suardo's *Il restauratore dei dipinti* (The Picture Restorer) (1927, reprint of the 1918 edition with foreword by Gaetano Previati) and *L'arte del marmo* (The Art of Marble) by Adolfo Wildt (1922).[10]

The text – as we learn from de Chirico's *Foreword* – was written in Paris between February and April 1928, in tandem with publication of a monograph on him by Boris Ternovec for the series "Arte Moderna Italiana", organised by Giovanni Scheiwiller himself and printed in autumn 1928[11], a year in which two other monographs on the artist appeared.[12] According to Jole de Sanna, the *Piccolo trattato* "is divided into three parts: material, tempera and oil"[13], a reading that is immediately evident but of slight significance due to the text's substantially colloquial structure[14] and its form, which is that of a book on painting technique formulas typical of art literature. Direct and immediate indications are given in the description of the ingredients whose quantities are stated with weights and measurements that are wholly empirical (soupspoon, coffee spoon) and proportional (1/3rd, 1/8th, 7/8th), thus hard to transpose into precisely measurable doses.

[10] J. de Sanna, *Forma come qualità del colore*, in G. de Chirico, *Piccolo trattato*, cit., 2001, p. 74.
[11] B. Ternovec, *Dipinti di Giorgio de Chirico*, Hoepli, Milan 1928.
[12] As well as solo shows in New York and London (W. George, *Giorgio de Chirico avec des fragments littéraires de l'artiste*, Editions des Chroniques du Jour, Paris 1928; J. Cocteau, *Le Mystère Laïc. Essai d'étude indirecte, avec cinq dessins de Giorgio de Chirico*, Editions des Quatre Chemins, Paris 1928).
[13] J. de Sanna, *Forma…*, cit., 2001, p. 63.
[14] Similarly the text of Wildt, who might have been behind Scheiwiller's commission since he had married the sculptor's daughter. Moreover de Chirico himself, in a letter of 23 April 1928 to Scheiwiller, bears out the terms of comparison represented by Wildt's booklet: "I'm sending today the 75 handwritten pages comprising my *Treatise* (…) I don't know how large it will be printed but I don't think it's shorter than Wildt's". *Ibid*., p. 117.

The painting formula book also typically reuses earlier sources, explicitly cited in only a few cases (Pliny, Biondo, Caylus) and more often than not tacitly recycled and inserted directly into the main text, having become part of the artist's interiorised cultural heritage. He no longer differentiates his thought from previous instructions, which have been assimilated unreservedly (as in the case of varnishing to be carried out after a year, taken from Cennini, or the Flemings' oil technique or the animal glue mentioned by Vasari).[15]

In order to identify more explicit citations, one must look to the artist's previous writings such as *Pro tempera oratio* (1920 c.)[16] and *Pro technica oratio* (1923)[17] which he reprises, blending and expanding their subject matter in the *Piccolo trattato* and his *Memoirs*[18] from which a more extensive bibliography may be drawn: from Pliny's *Naturalis Historia*[19] to Vasari's *Lives*[20] (the 19th century commentary by the Milanesi brothers includes the 1453-1475 recollections of Neri di Bicci[21]), right through to Michelangelo Biondo's *Della nobilissima pittura* (On the Noble Art of Painting) (1549)[22], to the *Mémoire sur la peinture à l'encaustique* (Memoir on Encaustic Painting) (1755) by Count Caylus[23] and the *Saggi* (Essays) of Vincenzo Requeno (1784)[24], subsequent 19th century research into wax painting by Henry Cros and Charles Henry and, lastly, to Jehan-Georges Vibert regarding the retouching varnish he invented.[25]

In the *Foreword* to the *Piccolo trattato* de Chirico shows right away that he is perfectly aware of the problems posed by ancient treatises with regard to 19th century manuals. He indicates the German texts as being most useful to a painter, but in the end comes to the conclusion that for all their excellence these sources too are limited, inasmuch as they were mainly "written by restorers" and therefore adopt a viewpoint quite different from that of the "painter hungry for practical knowledge that might help him in the delicate and serious effort of guiding a brush over canvas"[26]. An attempt to draw up an index of names cited in the text yields no apparent reference to restorers, be they German

[15] C. Cennini, *Il Libro dell'Arte* (late 14th c.). At the time de Chirico could have availed himself of the edition edited by Renzo Simi, Carabba, Lanciano 1913, or have consulted the 19th century one by the brothers Carlo and Gaetano Milanesi: C. and G. Milanesi, *Il libro dell'arte*, Le Monnier, Florence 1859. G. Vasari, *Le vite de' più eccellenti pittori, scultori, ed architettori*, with new annotations and comments by G. Milanesi, Florence, Sansoni, 1906, vol. 1, pp. 69-90.

[16] G. de Chirico, *Pro tempera oratio* (c. 1920), in "Metafisica. Quaderni della Fondazione Giorgio e Isa de Chirico", n. 5/6, 2006, pp. 475-480; English translation pp. 475-480.

[17] G. de Chirico, *Pro technica oratio* (1923), in Id., *Il meccanismo del pensiero. Critica, polemica, autobiografie 1911-1943*, edited by M. Fagiolo dell'Arco, Einaudi, Turin 1985, pp. 238-44. Now in *Giorgio de Chirico Scritti/1 (1911-1945). Romanzi e scritti critici e teorici*, edited by A. Cortellessa, Bompiani, Milan 2008, pp. 796-805.

[18] G. de Chirico, *The Memoirs of Giorgio de Chirico*, Astrolabio, Rome 1945; II expanded ed. Rizzoli, Milan 1962. English translation, Peter Owen, London 1971.

[19] Pliny, *Naturalis Historia, libri triginta septem* (1st century A.D.): currently available in many editions (e.g. Einaudi, Turin 1988) all of which however make general reference, as regards artistic technique, to the critical exegesis of Silvio Ferri, *Storia delle arti antiche* (1946), Rizzoli, Milan 2011, by now somewhat dated. De Chirico might have consulted a 19th century edition (*Della storia naturale*, ed. M. Lodovico Domenichi, Antonelli, Venice 1844) or drawn Pliny's suggestions from other texts.

[20] G. Vasari, *Le vite de' più eccellenti pittori, scultori, ed architettori*, with new annotations and comments by G. Milanesi, Sansoni, Florence 1906, vol. 1, pp. 69-90.

[21] Neri di Bicci, *Le Ricordanze (10 marzo 1453-24 aprile 1475)*, edited by B. Santi, Marlin, Pisa 1976.

[22] M. Biondo, *Della nobilissima pittura, et della sua arte, del modo, e della dottrina, di conseguirla, agevolmente et presto*, Bartolomeo Imperatore, Venice 1549.

[23] A.-C.-P. Caylus, *Mémoire sur la peinture à l'encaustique et sur la peinture à la cire*, Pissot, Geneva 1755.

[24] V. Requeño, *Saggi sul ristabilimento dell'antica arte de' Greci e de' Romani Pittori*, Giovanni Gatti, Venice 1784.

[25] H. Cros, C. Henry, *L'encaustique et les autres procédés de peinture chez les anciens. Histoire et techinques*, Librairie de l'Art, Paris 1884; J.G. Vibert, *La science*, cit.

[26] G. de Chirico, *Piccolo trattato*, cit., p. 5.

or Italian, although it should be remembered that the aforementioned manual by Giovanni Secco Suardo, reprinted by Hoepli in 1927, was in the artist's library[27], which at this point is worth studying in depth for more extensive knowledge of all the editions in his possession and their purchase dates.[28]

The most recurrent names however are those of artists: Dürer, Holbein, Michelangelo, Carpaccio, Rubens, Delacroix, Ingres, Courbet, and above all Arnold Böcklin who stands out for the direct references made to his technical experiments with cherry gum and encaustic painting, and even more so for his recovery of the ancient technique of marouflage.[29]

As rightly demonstrated by recent studies, de Chirico's explicit admiration for "Arnold Böcklin: the tireless technician"[30] derives from his attendance (albeit discontinuous and incomplete), at the Munich Fine Arts Academy between 1906 and 1909[31], recalled in his *Memoirs* as the most prestigious and culturally advanced of its day.[32]

De Chirico mentions obtaining documentation on Böcklin's technical research from "a book written by a German named Berger, which dealt with Böcklin's technique. In fact, the great Basel painter always painted in tempera and was a passionate researcher of all secrets concerning this method of painting", referring to a text published in Munich by Ernst Berger in the same year de Chirico arrived in the Bavarian capital.[33] In order to throw light on the Swiss painter's materials and techniques, Berger cited Rudolph Schick, Böcklin's assistant in Rome from 1866 to 1869[34], and of the considerable bibliography Böcklin had accumulated on ancient and modern painting techniques.

In 1893 Berger had begun publishing his research into the "Technische Mitteilungen für Malerei", the German Society bulletin for the "Promotion of Rational Methods in Painting" (Deutsche Gesellschaft zur Beförderung rationeller Malverfahren) founded in 1886 by the chemist Adolf Wilhelm Keim (1851-1913) together with the painter Franz von Lenbach (1836-1904) and Max von Pettenkofer (1818-1901). The latter particularly well known in Italy for his procedure of regenerating varnishes

[27] G. Secco Suardo, *Il ristauratore di dipinti*, Hoepli, Milan 1894 (reprinted: 1918, 1927) published posthumously by the heirs of the Count who was able to edit only the first part of the text, printed at his own expense with the title *Manuale ragionato per la parte meccanica del restauratore dei dipinti*, Tipografia Agnelli, Milan 1866, and sold at the Hoepli bookshop. See C. Giannini, *Giovanni Secco Suardo: alle origini del restauro moderno*, Edifir, Florence 2006.

[28] As stated in his *Memoirs* (cit., p. 127), de Chirico would continue even after publication of the *Piccolo trattato* to "perfect my research into technique" and to seek treatises and formulas from which to draw further information: "I spent entire afternoons with Isabella at the Richelieu library, searching in old treatises and writings on painting which had appeared at times when people still knew how to paint, for the secrets and forgotten science of the art of the brush. I also got to know restorers, scholars of technique including the painter Maroger who in those days held lectures on technique and had put on the market a medium in tubes which bore his name" (*ibid*., p. 128). Over and above the experiments of Jacques Maroger, in the years 1930-40 he also read the well known manual by Jean François Leonor Mérimée, *De la peinture à l'huile*, Huzard, Paris 1830, from which he got the formula for "emplastic oil" (See S. Vacanti, *From Mural Painting to "Emplastic Oil": Development and Diffusion of de Chirico's Technical Research between the 1930s and 1940s*, in "Metaphysical Art", n. 9/10, 2010, pp. 160-188), just as in the same period he seems to have acquired Califano Mundo's, *Il manuale della pittura a olio*, Itea, Naples 1938. See J. de Sanna, *Forma…*, cit., p. 74. At the end of the artist's *Memoirs* (cit., pp. 231-43) there is in fact a brief section entitled *The Technique of Painting*, in which the formulas for oil painting are updated.

[29] G. de Chirico, *Piccolo trattato*, cit., p. 26 ("canvas glued to panel").

[30] *Ibid*., p. 40.

[31] C. Compostella, *La "technica" di Giorgio de Chirico 1919-1925*, in "Bollettino ICR" 2001, new series, 3, pp. 2-38; S. Vacanti, *Giorgio de Chirico and the "Return to Craft". The Importance of Artistic Training between Athens and Munich*, in "Metafisica", n. 5/6, 2006, cit., pp. 433-458; see also A. Altamira, *De Chirico, Böcklin and Klinger*, ibid., pp. 51-79.

[32] "Everybody advised us to go to Germany, to Munich, so that I could go on studying painting and my brother music. Munich then was a bit like Paris today" (*Memoirs*, cit., p. 49); See also B.F. Miller, *Painting materials research in Munich from 1825 to 1937*, in A. Roy, P. Smith (editors), *Painting Techniques History, Materials and Studio Practice*, IIC, London 1998, pp. 246-248.

[33] G. de Chirico, *Memoirs*, cit., p. 114; E. Berger, *Böcklins Technik. Mit dem Bildnis des Meisters nach einem Relief von S. Landsinger*, Callwey, Munich 1906.

[34] Rudolf Schick (1840-1887), *Tagebuch auf Zeichnungen aus den Jahren 1866, 1868, 1869 über Arnold Böcklin*, Berlin 1901.

through alcoholic evaporation and copaiba balsam.[35] The Deutsche Gesellschaft aimed to promote the establishment of a state laboratory for the production and control of quality certificated painting materials, with view to combating and eliminating the instantaneous deterioration suffered by the most modern paintings executed with industrial products. In the early 1880s, Keim had set up a research laboratory on painting techniques (Versuchsstation für Maltechnik) at the Munich Fine Arts Academy to collect synthetic colours and subject them to chemical testing. This research, published in "Technische Mitteilungen für Malerei", resulted in the *Normalölfarben* for easel painting and *Mineralmalerei* for murals.[36] In 1893, the German Society headed by Keim organised, at the Glas Palast of Munich (from 20 July to 15 October), the first *Exhibition of Painting Techniques*, coordinated by a commission headed by Lenbach[37], associating it with a scientific congress in order to urge the Bavarian state to finance the research under way. Much research was presented by competing colour manufacturers at both the exhibition and the congress. The painter Wilhelm Beckmann displayed the properties of the newly patented *Syntonosfarben*[38] and Alphons Ludwig von Pereira publicised the colours (Tempera Pereira) he had invented in 1891[39], analogous to those of Friedlein, Neish and Richard Wurm[40], while Schmincke presented both tempera colours and Mussini Ölfarben.[41] The numerous tempera formulations on show, inasmuch as they were a water-soluble alternative to oil colours with less tendency to deteriorate and were closer to ancient painting techniques, enjoyed growing success among artists, including the very famous Franz von Stuck.[42]

The considerable competition soon turned into open conflict when Ernst Berger presented his research on the history of ancient painting techniques, based on the publication of old treatises and formula books, which interpreted the testimony of classical sources by recovering the 18th century view that the secret of Pompeian wall painting lay in the encaustic technique. To this end, he exhibited 36 technical reproductions of Etruscan, Greek, Roman and Byzantine paintings, whereas Keim strongly criticised such an interpretation which in his view lacked the necessary scientific corroboration. He, on the contrary, maintained that Roman painting technique was fresco, found to be in greater harmony with the production of its mineral colours.

[35] M. Pettenkofer, *Über Ölfarbe und Conservirung der Gemälde-Galerien durch das Regenerations-Verfahren*, Braunschweig 1870, which was published in Italian by G.U. Valentinis of Friuli as *Il restauro e la rigenerationе dei dipinti ad olio di Massimiliano de Pettenkofer*, Udine 1874; Id., *La riparazione dei dipinti secondo il metodo Pettenkofer*, Udine 1891; Id., *Il governo razionale delle pinacoteche desunto dalle teorie e pratiche di Massimiliano dr. De Pettenkofer*, Udine 1892. See for bibliography and overall historical identification: G. Perusini, *Il restauro dei dipinti nel secondo Ottocento. Giuseppe Uberto Valentinis e il metodo Pettenkofer*, Forum, Udine 2002.

[36] K. Kinseher, *Ernst Berger and the late 19th century Munich controversy over painting materials*, in *The Artist's Process. Technology and Interpretation*, edited by S. Eyb-Green et al., Archetype, London 2012, pp. 158-166, esp. p. 159.

[37] At the exhibition a room was set up with old works from the collection of Lenbach who, during Böcklin's stay in Munich (1872-74), had studied the treatises of Teofilo and Cennini with him, published in German by Albert Ilg in 1874 and 1871 respectively. R.H. Wackernagel, *"Ich werde die Leute ... in Oel und Tempera beschwindeln..." Neues zur maltechnik Wassily Kandinskys*, in "Zeitschrift für Kunsttechnologie und Konservierung", 1995, vol. 11, n. 1, pp. 97-128, esp. pp. 100-101; Vacanti, *Giorgio de Chirico and the "Return to Craft"...*, cit., p. 440.

[38] The patent describes the manufacture of colours in tubes where the binder consisted of gum arabic, linseed oil, glycerine, wax and green soap (K. Kinseher, *The institutional promotion of Tempera as an alternative medium: the role of the Deutsche Gesellschaft zur Beforderung rationeller Malverfabren in Munich and Adolf Keim*, Icom Conservation Committee, Art Technical Source Research, 1st Meeting of Tempera Group, Vienna 2010).

[39] K. Beltinger, *The use of Pereiratempera and Lompeck'sche Tempera (1900) by Cuno Amiet*, Icom, cit. (Lisbon 2011).

[40] E. Kruppa, *Farbe! Farbe! Farbe! Riesig, kräftig, energisch scharf erfasst*, Icom, cit. (Munich 2012).

[41] E.S.B. Ferreira, *Tempera paints in the late 19th-early 20th century works of Cuno Amiet. Our research approach*, Icom, cit. (Vienna 2010).

[42] Kinseher, *Ernst Berger*, cit., 2012, p. 160.

As Kinseher observed, "knowledge of past and old master painting techniques had an enormous impact on industrial production at the time. The good state of conservation of old paintings, especially the interpretation of the binders employed, influenced innovation in contemporary painting systems"[43]. The scientific dispute caused unpleasant implications since the state financing requested by the Deutsche Gesellschaft was denied, with a consequent falling off in research, whereas Berger – though expelled from the Society – received support from the Academy and the Ministry of Culture with a three year study grant. In 1902, he began his courses in painting techniques at the Munich Academy, at the same time publishing an expanded version of his studies of Mediaeval and Renaissance technical literature.[44] In 1903, Berger exhibited a new series of technical reconstructions at the Munich Kunstverein which gave rise to heated debate among the supporters of fresco and those of the opposite interpretation of tempera and encaustic painting, artists being the most hardened members of the latter faction[45], coupling the formulas retraced by Berger with both their own personal experimentation[46] and the testimony of early 19th century restoration manuals which had been first published in Germany.[47] In fact it was within this context that the term "tempera" became accepted and understood as an emulsion of proteic and oily materials[48]. De Chirico would later base the central and most considerable part of his *Piccolo trattato* to the tempera technique.

In describing the properties and the manufacturing methods of the tempera binder de Chirico first differentiates lean tempera from oil tempera, the latter being characterised by the addition of a drying oil and therefore constituted by an emulsion.

The painter also describes lean tempera as a mixture of several components of which the main one (glue or cherry gum) marks the mixture's properties and defects, as in the case of Cherry gum tempera which in his view is most suitable for painting on panels or robust cardboard: "The trouble with cherry gum tempera is that it creates a somewhat fragile material, so it is better not to use it for painting on a stretched canvas. Only panels and stout, well-primed cardboard may be advised"[49].

The components of the two typologies of lean tempera indicated by the artist are summarised in the following table, from which it is clear that we cannot actually speak of proteic tempera binder in

[43] *Ibid*., p. 162.

[44] E. Berger, *Beiträge zur Entwicklungsgeschichte der Maltechnik. Quellen für Maltechnik während der Renaissance und deren Folgezeit (XVI-XVIII Jahrhundert) in Italien, Spanien, den Niederlanden, Deutschland, Frankreich und England, nebst dem de Mayerne Manuskript*, Callwey, Munich 1901; Id., *Die Maltechnik des Altertums*, Callwey, Munich 1904; Id., *Beiträge zur Entwicklungsgeschichte der Maltechnik. Dritte Folge. Quellen und technik der fresko-, Öl- und Tempera-Malerei des Mittelalters von der byzantinischen Zeit bis einschliesslich der Erfindung der Ölmalerei durch die Brüder van Eyck, Callwey*, Munich 1912 (reprint of 1897 edition).

[45] First and foremost Franz Von Stuck and the group of Russian artists who arrived in Munich between 1895 and 1903 and took his courses, such as Kandinsky, Grabar, Jawlensky and Kardowsky, but also Paul Klee. See Wackernagel, *Ich werde die Leute*, cit.; W. Neugebauer, L. Lutz, *"The War" (1894) by Franz Stuck and "Good Friday" (1895) by Julius Exter: Painting technique of two monumental, symbolistic easel paintings*, Icom, cit. (Lisbon 2011).

[46] In his diary Grabar notes that he has found a new, wholly oil-free paint binder: "It's a copal resin balsam with cement [sic] mastic, dissolved in turpentine". See Wachernagel, *Ich werde die Leute*, cit., p. 134. In May 1899 he wrote enthusiastically of having identified in Titian and the Venetians a "marvellous [...] tempera which no one has understood, neither Böcklin nor Stuck" (*Ibid*., p. 134, n. 41), believing that the fig tree latex mentioned by Cennini was the secret ingredient that ensured elasticity of the paint mixture. Following Vasari, in the edition of the *Vite* published by Ernst Berger in 1897, he recommended the addition of very fresh fig branches to examine their effects with egg.

[47] G. Perusini, *Il Manuale di Christian Koester e il restauro in Italia e in Germania dal 1780 al 1830*, Edifir, Florence 2012, p. 33.

[48] E. Reinkowski, *Tempera. Zur Geschichte eines maltechnischen Begriffs*, in "Zeitschrift für Kunsttechnologie und Konservierung", 1994, vol. 8, n. 1, pp. 297-317.

[49] G. de Chirico, *Piccolo trattato*, cit., p. 35.

[50] *Ibid*., p. 36.

the current understandig of the term, given the presence of linseed oil with glue and egg in one case, and dammar or mastic varnish with oil of turpentine or petroleum in the other:

| Glue tempera | Cherry gum tempera |
|---|---|
| Strong glue | Cherry gum |
| Egg yolk | Egg yolk |
| Raw linseed oil | Dammar or mastic varnish |
| Vinegar | Vinegar |
| Water | Water |
| | Oil of turpentine or petroleum |
| | Glycerine |

De Chirico differentiated the variations of tempera *grassa* on the basis of the type of drying oil employed – boiled linseed in the one case, poppy-seed in the other – to which numerous other components were added to ensure that the paint mixes had the necessary density but also to prolong their fluidity while they were being laid on.

The so-named tempera with boiled linseed oil is described by de Chirico as "a very solid tempera, perhaps the most solid of all, almost an oil paint. Being highly elastic it is unlikely to crack even with thick impasto and in the parts most charged with white"[50].

| Tempera *grassa* with boiled linseed oil | Tempera *grassa* with poppy-seed oil |
|---|---|
| Egg yolk | Egg yolk |
| Egg white | Poppy-seed oil |
| Boiled linseed oil | Oil of turpentine or petroleum |
| Venetian turpentine | Glycerine |
| Marseilles soap | Vinegar |
| Vinegar | Water |
| Water | |

Whereas he considers poppy-seed emulsion as "clear, solid and elastic. It brightens with varnishing but does not darken; the whites do not change; the colours, right from the first brushstrokes, never become too opaque. It allows long working time and also bears a thick impasto, with no risk of cracks"[51].

The list of ingredients cited in the formulas evidences knowledge of ancient sources, tempered by his studies and the ongoing debate among artists who gravitated around the Munich Academy: for example, dammar varnish could not have been mentioned in any Mediaeval or Renaissance source since it was only made known in 1829 by Friedrich Lucanus, a pharmacist of Halberstadt and author of a manual on the restoration of oil paintings. In the appendix, he included what would be the earliest text dealing with the restoration of tempera pictures, written by Jacob Schlesinger in 1828

[51] *Ibid*., p. 42.
[52] F.G.H. Lucanus, *Grundliche und vollständige Anleitung zur Erbaltung, Reinigung und Wiederberstellung der Gemälden in Öl-, Tempera-, Leim-,*

and first published in the 2nd booklet of Christian Koester's treatise on restoration (1827-1830).[52] These are probably the texts by restorers to which de Chirico refers. And as Giuseppina Perusini rightly observes, German publishing was the most prolific in the 19th century, during the first half of which no less than five treatises on picture restoration appeared, versus two manuals in Italy which appeared only at the end of the century.[53] This bears witness to the fundamental interest that the conservation of old pictures aroused among German researchers, and with it the theme of old painting techniques, tackled with antithetical approaches by artists and scientists.

Among the sources that de Chirico could draw on also emerges, almost bashfully and without any display, the practical information supplied by two painters he had got to know in Florence when he was copying old masters at the Uffizi: "In front of certain portraits by Dürer or Holbein, in front of the Grand Duke's *Madonna* or *Madonna of the Chair*"[54]. The names of the two painters are not even mentioned in the *Piccolo trattato*, as if he did nott want to include them among his sources, but they were later recalled in his *Memoirs*: the Florentine Enrico Bettarini and the Russian Nicola Locoff.

De Chirico states that the former was "highly skilled in tempera painting"[55], but no other information about him has been traced except that for a long time (1897-1983) he was chiefly active as a decorator and that he taught at the Porta Romana Art Institute in Florence where some of his paintings now hang in its Gallery of Modern Art.

The activity of Locoff (Nikolaj Nikolaevic Lochov, Pskov 1872 – Florence 7 July 1948) is much better known. This Russian artist arrived in the Tuscan capital in 1913 with a commission to reproduce Italian Renaissance frescoes and paintings on panels to be exhibited at the Moscow State Museum for new western art. It is perhaps worth recalling Jole de Sanna's note on Boris Nicolaevic Ternovec (or Ternovetz), a Russian art historian and critic who during the 1920s and 1930s was director of the said museum, which was closed in 1945 and its collections dispersed among the Pushkin Museum and the Hermitage Museum of St Petersburg.[56]

Lochov began producing copies, reproducing the old technique with such precision that between 1913 and 1915 he had executed only nine of the envisaged 70. On the outbreak of the revolution, having sent home only a very limited number of pictures, he found himself isolated in Italy where, however, he decided to remain and paint.[57]

*Wasser-, Miniatur-, Posteli- und Wachsfarben, Halberstadt* 1832; J. Schlesinger, *Über Tempera-Bilder und deren Restauration*, in C. Koester, *Über Restauration alter Ölgemälde,* Heidelberg 1828, 2nd booklet. See Perusini, *Il Manuale*, cit., pp. 39, 171-74.

[53] Perusini, *Il Manuale*, cit., p. 33.

[54] G. de Chirico, *Piccolo trattato*, p. 31. The names of Dürer and Holbein are not random but significant references to German culture, within which they were considered the most important artists of the Renaissance. See Perusini, *Il Manuale*, cit., p. 43, note 36.

[55] G. de Chirico, *Memoirs*, cit., p. 114.

[56] Ternovec "had the task of setting up the Soviet pavilion at the Florence International Book Fair in 1922 and at the 1924 Venice Biennale, as well as the International Exhibition of Decorative Arts at Monza in 1927. On these occasions he met Giovanni Scheiwiller with whom he began a correspondence that lasted until 1936. During and subsequent to these travels Ternovec extended his interest in Italian art (…). Especially in 1927 when he had occasion to stay in Milan and, accompanied by Scheiwiller, to visit the studios of various painters and compare impressions and judgements with the publisher, who commissioned him to write an essay for monograph n. 10 of 'Arte Moderna Italiana' dedicated to Giorgio de Chirico". See J. de Sanna, *Forma…*, cit., 2001, p. 76.

[57] M. Logan Berenson, *Reconstructor of Old Masterpieces*, "American Magazine of Art", November 1930, pp. 628-638.

[58] G. de Chirico, *Memoirs*, cit., p. 113.

This was how his meeting with de Chirico came about, as the latter evokes in his *Memoirs*: "During my many stays in Florence between 1919 and 1924, I was copying Michelangelo's *Holy Family* at the Uffizi when I met the Russian painter Nicola Locoff. He explained to me that many old pictures, which seemed to be oil paintings, are in fact varnished oil tempera. Tempera attracted me; I began to seek formulas for this technique and for a few years I painted in tempera"[58].

The conviction that 16th century painting both in central Italy and the Veneto (but also in Flemish painting up to Rubens) normally used an oil tempera binder was upheld by numerous authoritative 19th century testimonies (Selvatico 1842, Merimée 1830 and Marcucci 1813) which in turn had reprised earlier texts (Felibien 1676, Ridolfi 1648 and Armenini 1586).[59] In actual fact, as may be clearly seen by checking the texts in question, none of the earliest authors had ever dreamt of making such a statement. They said only that canvas preparation (or priming), especially by Titian and Paolo Veronese, was still done with size (rather than oil), on which they then painted with oil colours.

Without distinguishing between priming and laying on colour, the technique had been interpreted as oil tempera with a serious, basic misunderstanding which would then be passed on to German scholars (such as Berger): "In certain paintings by Titian and Paolo Veronese one sees that they did their priming with tempera and then painted with oil colours" (Felibien 1676); "Veronese prepared his pictures with tempera and size, then fixed them with a coat of good glue and then a coat of mastic varnish, finishing them with oil: if a little honey is added to the glue the canvas will remain more elastic" (Marcucci 1813); "Like Titian, Paolo Veronese sketched out with much colour and often painted on canvases primed with tempera; he then sketched out in colours ground with water. This infinitely expeditious process, which must have been a kind of transition between tempera and oil painting, is described by Leonardo da Vinci. It is a method with infinite advantages" (Selvatico 1842).[60]

The recent essay by Lycia Giola Pavia and Alessandro Pavia gives an overview, as clear as it is concise, of the innumerable experiments de Chirico made throughout his life with preparations, binders, the spreading of colours and the execution of his paintings. He noted down formulas, collecting them here and there on numerous scraps of paper, with criteria at once disorganised yet systematic. In addition to the various annotations, which one can imagine as copied from written sources[61], one should, in fact, also consider the talks and discussions too, including lively exchanges of opinion with other artists of perhaps divergent viewpoints, as art is undoubtedly nourished by art.

In any case, de Chirico himself is testimony to this: "The painter Nicola Locoff, whom I visited in his studio, showed me some copies he had made from Botticelli, Masaccio, Carpaccio, Titian and

[59] E. Reinkowski, *Reception of tempera techniques in the 19th century*, Icom, cit. (Vienna 2010).

[60] P.E. Selvatico, *Sull'educazione del pittore storico odierno italiano. Pensieri*, Padua, Coi tipi del Seminario, 1842, p. 229. A complete discussion on tempera, considered as the only technique capable of avoiding the darkening of paint (through sketching out in tempera and finishing with oil glazes) is drawn up in: P.E. Selvatico, *La pittura a olio e a tempera presso gli antichi e i moderni*, in "Nuova Antologia", March 1870, vol. XIII, issue 3, pp. 505-520.

[61] This is true at least in the case of «Ricetta Zu» (n. 26) and the «Ricette Zuccheri» (n. 57) referred to by the Pavias; in all likelihood the formulas were taken from: L. Zuccheri, *Del pitturar a tempera. Sei ricette di Luigi Zuccheri scritte in veneziano, italiano, inglese*, All'insegna del pesce d'oro, Milan 1966. It is probably no accident that once more the publishing house was headed by Scheiwiller.

[62] G. de Chirico, *Memoirs*, cit., p. 113.

Rembrandt; I was astounded by the accuracy of these copies and the mastery of execution, but when I tried to ask Locoff for his formulas or clarifications about the systems and materials used, he always answered in a confused way, verging more on literature than on concrete talk about painting"[62].

In Florence at the end of the First World War Lochov had got to know Edward Waldo Forbes who was so impressed by his copies that he decided to buy three of them at once, including Benozzo Gozzoli's *Procession of the Magi* and Titian's *Concert*, in spite of the fact that the Fogg Art Museum which Forbes had founded at Harvard purchased solely originals.[63] In 1932 he followed up by buying a copy of Masaccio's *Expulsion of Adam and Eve* in the Brancacci chapel.

In the American museum's catalogue published in 1936 the copies of old Italian masters are proudly mentioned: "…made by a Russian artist, Nicola Lochoff, are valuable to students because it is almost wholly by means of reproductions that this phase of Italian painting can be studied in America. These reproductions represent years of study of the technical processes of the early Italian masters. One of them, a detail of the *Procession of the Magi*, the original by Benozzo Gozzoli, is in the Large Lecture Hall downstairs; the other, a copy of the *Expulsion of Adam and Eve* by Masaccio, is in one of the second floor corridors surrounding the Court"[64].

As Francesca Bewer points out, Lochov's copies were particularly appreciated for their technical fidelity by American scholars, outstanding among whom was the then young Daniel Varley Thompson who, as well as accompanying Forbes on his travels abroad, was also an assistant on the university course "Methods and Processes of Italian Painting". During a seminar held at the College Art Association in 1923, Thompson declared that by following "[Lochoff's] method of study I found a Master in every ruined fresco and every other painting, and there are no European teachers more important than the relics one commonly comes across"[65].

In spring 1923, Forbes, Lochov and Thompson carried out experiments with fresco technique on the garden wall of a villa Forbes had rented on the outskirts of Florence, which turned out to be fundamental for the American scholars' teaching courses at Harvard. Indeed, Thompson explicitly thanked Lochov in the foreword to the first American edition of Cennino Cennini's *Libro dell'Arte* (1933) which made him world famous.[66]

This incursion into the American continent should not seem out of place since in the years when de Chirico took up the tempera technique as the most suitable to his own pictorial language, the same phenomenon began to emerge among American artists, and one of the reasons at the heart of this technical recovery may be identified in the influence exerted by frequenting the same cultural environment.

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[63] F. Bewer, *A Laboratory for Art. Harvard's Fogg Museum and the Emergence of Conservation in America, 1900-1950*, Harvard Art Museum-Yale University Press, Cambridge (Mass.) 2010, p. 87.

[64] *Harvard University Handbook; an Official Guide to the Grounds, Buildings, Libraries, Museums, and Laboratories, with notes on the History, Development and Activities of all departments of the University*, Harvard University Press, Cambridge Mass. 1936.

[65] F. Bewer, *A Laboratory*, cit., p. 87.

[66] "If my translation reveals a better understanding, the credit belongs to others: first, and in greatest measure, to Edward Waldo Forbes, to whom these volumes are inscribed, who first expounded Cennino to me, and whose researches are embodied in every page; then to the masters under whom, through the liberality of Mr. Forbes, I carried on my study; Nicolas Lochoff, the peerless copyist of early Italian painting, and Federigo Ioni, master of archaic styles and methods" (D.V. Thompson, *Cennino D'Andrea Cennini. The Craftsman's Handbook. The Italian "Il Libro dell'Arte"*, Yale University Press, New York 1933.

[67] F. Bewer, *A Laboratory*, cit., p. 84. Both Doerner and Eibner would then publish a compendium of twenty years of research with texts that became well known all over the world: M. Doerner, *Malmaterial und seine Verwendung im Bilde: nach den Vorträgen an der Akademie der bildenden Künste*

Like de Chirico, Thompson too had pursued an apprenticeship in Munich where he stayed for several months in 1922, in contact with restoration and art history experts, in particular with Max Doerner (who taught painting at the Munich Academy and was president of the Deutsche Gesellschaft since 1911) and with Alexander Eibner (Director of the Research Laboratory on Painting Techniques).[67] Unlike Thompson however, it is wholly unlikely that de Chirico had direct or indirect contact with Doerner at the time of writing the *Piccolo trattato*: because the edition of Doerner's famous manual in the artist's possession is dated 1938, and because de Chirico's point of view differed entirely from that of the German researcher who, with the members of the Deutsche Gesellschaft, believed that Pompeian painting was fresco whereas the *Pictor Optimus*, in the wake of Böcklin's convictions and the studies carried out to date in Italy, still held the hypothesis of encaustic painting to be valid.[68]

In Florence, where Böcklin lived for a long time, having established himself during the last years of his life by purchasing a villa in San Donato near Fiesole (where he died in 1901), his cultural and technical legacy remained especially alive, due in part to the copying and restoration activities of Otto Vermehren to whom Böcklin had left his paints.[69] Thanks to the specific knowledge of ancient painting techniques which he had learnt during his academic training, Otto Vermehren was entrusted with delicate restoration interventions at the Uffizi[70], which was the main practical apprenticeship served by his son Augusto who subsequently became technical head of the Culture Service's restoration laboratory. A chemistry and physics enthusiast, up to the 1920s he carried out studies on ancient paints and paint binders in function of proper conservation of the works in the Florentine galleries.

In the 1970s, several scientific investigations were carried out on the collection of pigments (which the Vermehrens had jealously guarded) in order to identify the materials and painting technique adopted by Arnold Böcklin[71]. Today, inquiries such as these have become more oriented towards the binders[72] by reconstructing the preparation methods for cherry gum tempera with a mixture of walnut oil and copaiba balsam. Recent research under way at the Doerner Institut of Munich has ascertained that due to difficulties in applying the binder, Böcklin did not make the binder himself but, in the last years of his life, ordered it from the English pharmacy which Henry Roberts had opened in 1843 in Via Tornabuoni, Florence (and which made him famous in 1878 with production of the renowned *Borotalco* still on sale today).

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*in München*, Verlag für praktische Kunstwissenschaft, Munich 1921; A. Eibner, *Entwicklung und werstkoffe der Wandmalerei vom Altertums bis zur Neuzeit*, Callwey, Munich 1926.

[68] S. Vacanti, *Il recupero dell'encausto nell'arte italiana durante il ventennio fascista. Teoria, sperimentazione, ideologia*, in C. Bordino, R. Di Noia (editors), *La Ricerca Giovane in cammino per l'arte*, Gangemi, Rome 2012, pp. 117-135; G. Prisco, *Tra ideologia e reminiscenze storiche: il dibattito sulla tecnica esecutiva della pittura murale romana ai tempi del duce*, in M.I. Catalano, P. Mania (editors), *Arte e memoria dell'arte*, Gli Ori, Pistoia 2011, pp. 211-233; T. Perusini et al., *Il muralismo italiano degli anni Trenta: problemi tecnici ed analitici: un excursus attraverso l'analisi di pitture di Sironi, de Chirico, Cagli, Afro e Sbisà*, in *Sulle pitture murali: riflessione, conoscenze, interventi*, edited by G. Biscontin, G. Driussi, Edizioni Arcadia Ricerche, Venice 2005, pp. 1353-1368.

[69] M.D. Mazzoni, *La donazione Bruschi-Vermehren*, in "OPD Restauro", n. 20, 2008, pp. 346-348.

[70] M. Ciatti, *Appunti per un manuale di storia e di teoria del restauro*, Edifir, Florence 2009; A. Conti, *Storia del restauro e della conservazione delle opere d'arte*, Electa, Milan 1988.

[71] H. Kühn, *Die pigmente in den Gemalden der Sback-Galerie, Bayerisce Staaatsgemaldesammlungen*, Doerner Institut, Munich, 1969; E.L. Richter, H. Härlin, *The Pigments of the Swiss Nineteenth-century Painter Arnold Böcklin*, in "Studies in Conservation", 1974, 19, pp. 83-87.

[72] K. Beltinger, *Swiss tempera painters around 1900*, Icom, cit. (Vienna 2010); P. Dietemann, U. Bauer, I. Fiedler, W. Neugebauer, *Sources, Technological information and analytical data from two Tempera paintings by Arnold Böcklin*, ibid.; W. Neugebauer, *From Böcklin to Kandinsky. Art technological examinations and source research on tempera painting around 1900 in Munich*, ibid.

[73] E. Reinkowski, *Emulsions for water colours*, Icom, cit. (Munich 2012).

[74] E. Pagliani, *Nota di restauro (Ettore e Andromaca)*, in *Giorgio de Chirico 1888-1978*, edited by P. Vivarelli, De Luca, Rome 1981, pp. 44-47;

In 1902, Hermann Urban, Böcklin's pupil in Florence (1892-94), purchased from the English pharmacy the gum-based emulsion prepared according to the master's formula and in 1909 began production of his own tempera paints.[73] Urban's formulas, which are still being studied, are fairly numerous and subdivided into five different typologies (cherry gum, gum arabic, gum Senegal, egg yolk, casein) as summarised in the table below:

| Cherry gum | Gum arabic | Gum Senegal | Egg yolk | Casein |
|---|---|---|---|---|
| Cherry gum | Gum arabic | Gum Senegal | Egg yolk | Casein |
| Copaiba balsam | Copaiba balsam | Copaiba balsam | Gum Senegal | Turpentine |
| Amber | Amber | Mastic | Mastic | Borax |
| Mastic | Mastic | Sugar | Copaiba balsam | Water |
| | Candy | Wax | Vinegar | |
| | | | | |
| Cherry gum | Gum arabic | Gum Senegal | | Casein |
| Copaiba balsam | Copal | Copal | | Copaiba balsam |
| Copal | Mastic | Mastic | | Amber |
| Mastic | Candy | Candy | | Copal |
| | | Wax | | Candy |
| | | | | |
| | Gum arabic | Gum Senegal | | |
| | Copal | Copal | | |
| | Mastic | Mastic | | |
| | Candy | Candy | | |
| | Wax | Wax | | |

The scientific investigations carried out on de Chirico's paintings[74] do not reveal whether he was aware of the preparation on sale at the English pharmacy or ever used it; neither is it possible to make a comparison with the formulas in the *Piccolo trattato*, nor to distinguish the binders he effectively employed between 1919, when he began experimenting with tempera, and his subsequent abandoning of it to return to oils in 1925.

Those sudden second thoughts about oil binder should be closely linked to the expressive needs of the artist who, after many years of experimentation and reflection, came in the end to believe that "oil painting offers many resources that cannot be achieved with tempera"[75]. It is probable that de Chirico's passion for glazes and the laying on of refined plays of colour made him aware that those effects could be obtained solely with a transparent binder like oil (poppy-seed oil in particular), whereas the viscosity of tempera, albeit mixed with oily and resinous components, naturally impeded the achievement of such painterly ends.

Compostella, *La "technica"*, cit.; R. Cesareo, A. Castellano, G. Buccolieri, S. Quarta, M. Marabelli, P. Santopadre, M. Ioele, G.E. Gigante, S. Ridolfi, *From Giotto to de Chirico: analysis of paintings with portable EDXRF equipment*, in *Cultural Heritage Conservation and Environmental Impact Assessment by ND testing and Micro-Analysis*, edited by R. van Grieken, K. Janssens, Taylor & Francis Group, London 2005, pp. 183-196; L. Giola Pavia, *Giorgio de Chirico – The Painter. Material, Gesture and Chance*, in "Metaphysical Art", n. 9/10, 2011, pp. 138-159.

[75] G. de Chirico, *Piccolo trattato*, cit., p. 44.

The research and heated debate on painting techniques that took place in Munich therefore had more than an echo in Italy, and especially Florence where, wishing to close the circle of the recovery of tempera techniques, we should not neglect the intense activity of Icilio Federico Joni, Umberto Giunti and others in producing fakes of the most important Italian Renaissance masterpieces, thus contributing to a complete picture of the sources to which de Chirico could have referred in gathering documentary evidence about ancient tempera and the techniques Italian painters used in laying on oil, from which he drew the formulas most appropriate to the painterly representation he desired.

*Traslated by David Smith*