# Imaging Analysis as Support for the Work of Fondazione Giorgio e Isa de Chirico

*Stefano Ridolfi, Ars Mensurae, Rome*

## Introduction

The need to safeguard the moral integrity of an important artist such as Giorgio de Chirico is one of the principal aspects of the work carried out by the Foundation that carries his name. His works have forever been copied and forged, and especially in this current historical moment of economic and social crisis in which art is considered an important and safe investment. De Chirico's artwork has always generated great interest in the art market and so it follows it has also attracted the interest of many forgers.

For several years now, Fondazione Giorgio e Isa de Chirico together with Ars Mensurae, has been carrying out a project for the characterisation, through non-invasive and micro-invasive techniques, of the constituent material of the artist's works as well as that of fake works. This research is carried out with innovative and patented instruments that have been purposely developed (Patent for industrial invention "Metodo di identificazione di dipinti" [Painting identification method]).

Through comparative studies of diagnostic research, together with the historical and critical knowledge of art experts and documentation from the de Chirico Foundation, a methodology of pattern recognition is being assembled, which provides data of utmost reliability on the paintings analysed.

Scientific analysis alone is not able to assign a particular painting to its author, it can however exclude an erroneous attribution through the anachronisms of a pigment or support. This prospect in itself is worthy of dedicating scientific analysis during the attribution process. Scientific analysis becomes even more powerful when it is carried out in reference to a database.

Even if one imagines an artist's life as being chaotic one cannot exclude that during certain periods, even if very limited, the artist experiments with and utilises certain pigments and techniques or a combination of them in an intensive, personal way. The study of techniques and painting materials of specific origin and date allows for the definition of parameter clusters within which it is possible to identify, with a fair degree of reliability, paintings produced in the same period but not yet attributed to the artist.

The current project foresees the use of non-invasive imaging and spectroscopic diagnostic techniques on authentic de Chirico paintings as well as on those currently awaiting attribution. In the first case the results become an integral part of the reference group, thus amplifying it, whilst in

the latter the data is compared to the reference group itself. It may soon be possible (and this is a goal we are working towards) to recognise, even in non-attributed works, some common characterising elements of known forgeries that will allow for the definition of reference clusters on fakes, through which such forgeries may eventually be traced to a specific serial forger.

So far this methodology has been applied to over 40 paintings of certified origin and to about ten paintings still to be attributed. The study has already proved useful in the fight against the falsification of de Chirico's paintings, with successful criminal proceedings based upon its findings.

This essay will briefly introduce the scientific techniques used and will give some information on the applied methodology, although, without getting into too much detail, to avoid supplying sensitive information that could aid forgers in the production of 'scientific forgeries'.

The closing chapter will illustrate the case of *Le Revenant*, a painting attributed to the hand of the artist by Fondazione Giorgio e Isa de Chirico and currently in the collection of the Musée Nationale d'Art Moderne, at Centres Georges Pompidou in Paris.

## Investigative techniques

The investigative techniques used in the standard procedure applied to paintings by de Chirico can be divided in various classifications. On one side there is a subdivision between invasive and non-invasive methods and, on the other, between imaging techniques and spectroscopic analysis. The difference between non-invasive and invasive techniques distinguishes between scientific investigations that do not require a sample being taken from the artwork, as opposed to those techniques that require at least a micro-sample. Regardless of the fact that a single sample is no bigger than a couple of square millimetres, analysis by sampling is in any case a technique that causes damage to the artwork. This is not the forum in which to discuss the merits for or against the two approaches, which needless to say follow the golden rule of "minimum necessary" in which a constant compromise between the need to maintain the artwork's integrity and the need to achieve reliable scientific results occurs. It follows that it is necessary to search for alternative investigative methods in order to reduce even further the number of samples taken, even if this entails the eventual detriment of the comprehensiveness of the results achieved. The assortment of non-invasive research techniques has increased greatly over the last few years, for that which concerns methodology as well as the miniaturisation and portability of the instruments, in a way that was absolutely unthinkable only a few years ago.[1]

The possibility of building and using compact digital instruments such as Digital X-ray or XRF techniques and Raman Imaging, has allowed the present writer to analyse the, for instance, the entire surface of a Rubens painting of 15 square metres in just three days on location at Musée de Grenoble in France where the painting is conserved.[2] Obviously for Fondazione Giorgio e Isa de Chirico's

[1] G. E. Gigante, S. Ridolfi, *X-Ray Techniques and X-Ray Fluorescence with Portable Systems*, in *Conservation Science for Cultural Heritage: Applications of Instrumental Analysis*, in *Lecture Notes in Chemistry*, Springer Verlag, 2012.

[2] S. Ridolfi, K. Buttler, G. Wolf, H. Vincent, I. Carocci, *Non-invasive analyses on Peter Paul Rubens painting: Saint Gregory the Great surrounded by the Saints Papianus, Maurus, Flavia Domitilla, Nereus and Achilleus*, in Musée de Grenoble, ART'11, 10th International Conference on Non-Destructive and Microanalysis for the Diagnostic and Conservation of Cultural and Environmental Heritage, Florence 2011.

project the decision was taken to use only non-invasive analysis and only on rare occasions has a micro-sampling been necessary for stratigraphical analysis.

With regard to the question of imaging techniques versus specific spectroscopic analyses, the first type includes imagery taken in visible, near infrared (1100 and 1700 nanometres) digital X-ray, UV Fluorescence, false colour techinique and generally all multispectral techniques.[3] The end result is an image of a smaller or larger area of the painting's surface that emphasises the characteristics of the work in relation to different wavelengths, to which the sensors are tuned to. In the multispectral methodology used in our project we start from the pre-nanometre (for the X-rays) up to 1700 nanometres for the IR Reflectance with the InGaAs sensor. The spectroscopic analyses in this project are made with X-ray Fluorescence (XRF) and Raman spectroscopy.[4] The analyses are made *in loco* with portable systems and the surface is analysed in quadrants measuring two square millimetres. With the XRF technique information can be obtained from all layers of a painting, from the support to the protective varnish, whilst with the Raman the information is specific only to the last layer of paint in the area being analysed. An avenue of research giving very useful results involves the integration of multispectral and spectroscopic techniques: thus integrating the information relative to large surfaces with those coming from measuring points defined in limited spaces.

### *Le Revenant*

The case of *Le Revenant*, 1918 (oil on canvas, 94x77.9 cm), currently on display at Centre Georges Pompidou in Paris, is certainly one of the most interesting. Scientific techniques played a significant role in the long, thought-out process that eventually led the Foundation to attribute the work to de Chirico. What follows are some of the results from the scientific analysis in which sensitive information which could be useful for the production of a so called scientific forgery has been omitted.

In figures 1 and 2 we see the front and back of the painting under examination. The procedure was purposely developed for this project with specific imaging and precise spectroscopic techniques designed to be used together. No destructive micro-sampling was used. It follows that

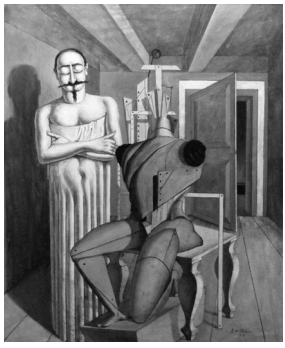

*fig. 1* G. de Chirico, *Le Revenant,* Musée National d'Art Moderne, Centre Georges Pompidou, Paris

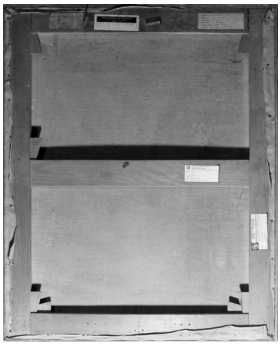

*fig. 2* Back of *Le Revenant*

[3] G. Poldi, G.C.F. Villa, *Dalla conservazione alla storia dell'arte, Riflettografia ed analisi non invasive per lo studio di dipinti*, Ed. della Normale, Pisa 2006.
[4] R. Cesareo, S. Ridolfi *et alii, Portable Systems for EDXRF Analysis of Works of Art, in Portable X-Ray Fluorescence Spectrometry*, The Royal Society of Chemistry, Cambridge 2008.

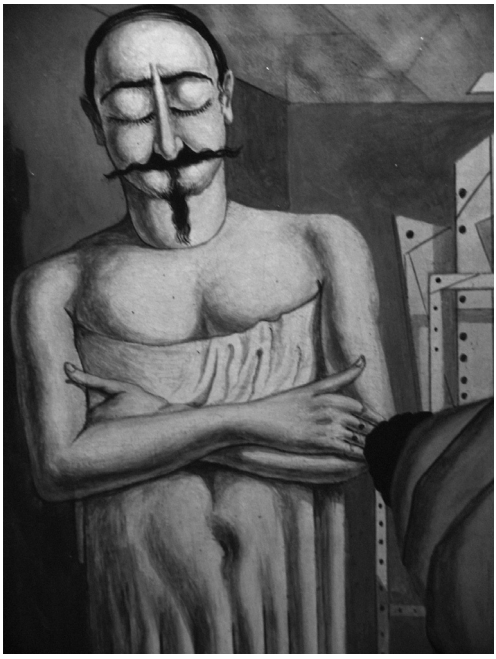

*fig. 3* Detail of Infrared Reflectance at 1100 nanometres

*fig. 4* Complete digital X-ray of the painting analysed

all the information relative to the visible and underlying layers were the result of non-invasive techniques. The information was then compared to a database of certified de Chirico paintings, reaching a highly reliable result.

Figure n. 3 shows a detail of Infrared Reflectance with CCD at 1100 nanometres, in which the sketched outlines traced by the artist prior to applying paint are evident.

Insomuch as preparatory drawings cannot be easily distinguished, as well as the fact that they originate directly from the artist's hand and follow the evolution of his technique, they are not easily forged. The information inherent in this layer forms part of those parameters that are calculated in order to certify a painting's origins.

Figure n. 4 presents a digital X-ray of the entire painting. We can immediately see some important changes made by the artist during the creation of the work, but even more importantly, we find particular characteristics of Giorgio de Chirico's *modus operandi* only visible through X-ray. This also applies to Infrared Reflectance and in general to multispectral imagery, this information also falls into the parameters used to define the painting's authenticity.

Without delving too far into the issue of the pigments that form de Chirico's palette in various moments of his artistic production, figure n. 5 shows the areas analysed using XRF and Raman spectroscopy. The recognition of the pigments used by the painter is a fundamental point in the definition of a group of authentic paintings by the artist.

Whilst the conversion of visual information into parametric information derived from imaging techniques requires careful attention, as well as great sensibility and knowledge of the techniques utilised by the artist (and by his forgers), the information derived from his palette is automatically definable.

Clearly however we cannot limit our argument to a banal anachronism between the presumed date of the painting and the commercial availability of a certain pigment. It is a know fact that de Chirico made his own pigments in his studio and that he enjoyed playing with dates and styles, often confusing the two. The setting of the parameters of the painter's palette is more in keeping with the passage of time as relative to the artist in question as opposed to the passage of time in an absolute sense. Through the analysis of recognised original paintings we are defining a personal timeline of Giorgio de Chirico's palette. The creation of this timeline will have the final result of increasing our knowledge of which pigments, pure or mixed, the painter used in the various phases of his life.

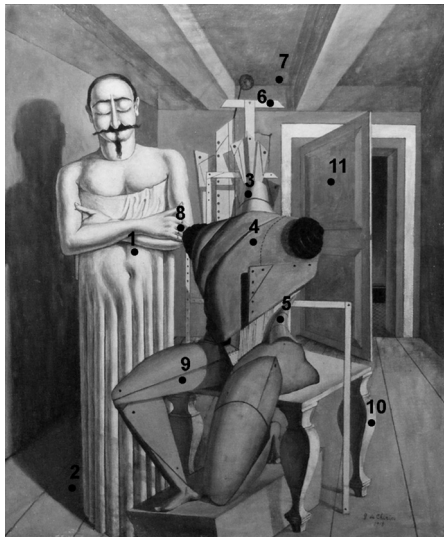


*fig. 5* Points analysed with XRF and Raman spectroscopic techniques

*Translated by Marco Mona*