

Something important missing

A technical review of the book and some notes on the exhibition "Russische Avantgarde im Museum Ludwig. Original und Fälschung. Fragen, Untersuchungen, Erklärungen"

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"Russische Avantgarde im Museum Ludwig. Original und Fälschung. Fragen, Untersuchungen, Erklärungen", Rita Kersting und Petra Mandt (Herausg.), Katalog der Ausstellung (Köln, Museum Ludwig, 26. September 2020 - 3. January 2021), Verlag der Buchhandlung Walther und Franz König, Köln 2020 (with English translation).

1. Introductory considerations, involving method and research transparency

This volume flanks the exhibition of the same name currently underway at the Museum Ludwig in Cologne and emphasizes the title and the first contribution by Rita Kersting, "Russian avant-garde at the museum Ludwig: original and fake", on the aim of presenting some works considered false, or in any case questionable, alongside paintings believed to be of certain attribution and correct dating. A set of scientific analyses, both non invasive and micro-invasive, was carried out.

The exhibition and the catalogue can be seen in part as an operation of "transparency" that a museum like Museum Ludwig, whose collection includes some famous masterpieces of Russian art of the 20th century, should carry out as a normal activity: **that is the constant research on their works**, including also the verification of their authenticity or their chronology, if this is in any way questioned. An operation that could appear courageous to the unwitting reader because it is not kept inside the walls of the Museum, or only left to the small world of experts, but **presented to a wide public**, stressing its educational potentiality, with the idea that the Museum is not afraid to deal with scientific diagnostics and to compete with the depreciation of some works and with any discussions that may arise.

But, as I'll try to show, the operation that occurred is not fully transparent and it is not clear from the published text and from the exhibition if it was carried out with that **great systematicity and enormous seriousness and competence that are needed**, particularly in these contexts. A competence of all the actors involved, of course: curators, art historians who are experts of each of the selected artists, conservators/restorers, conservation scientists who include chemists, physicists, etc.

In fact, as known by specialists, **only a detailed presentation of the acquired scientific data (research transparency)** and a wide effort of **comparison** with many other works of the same author (also studied with scientific exams) gives normally in these cases the

more correct results, or can better address the questions. “Address the questions”: because, in fact, it’s important to remember that generally, meaning in the large number of cases, also the most accurate scientific examinations **don’t give answers about the exact dating nor attribution**. Scientific diagnostics on artworks – paintings, in this case – are extremely important and currently very refined tools to obtain information about technique, materials and conservation, but they must be perfectly carried out and interpreted, documenting each phase and choice. Then art historians and conservators have to read and fully understand these data and to compare them with the literature regarding analyses and art history.

In the case of an exhibition like the Ludwig one, data should be displayed on a double register: on the one hand for the general public, for non-specialists, on the other for specialists, that is, for those who are actually able to evaluate and comment on the work done.

In the case of this volume and of the related exhibition, there is **no presentation of the scientific data as complete and accurate as possible**, which could have been entrusted to web resources, **preventing a careful and irrefutable evaluation of the same by sector experts**.

About the latter point, always, in the scientific field (this is what we are talking about, having been carried out on the works a series of scientific examinations), the data must be able to be read, and therefore presented, starting from the methods with which they were collected, in fact in scientific papers, after the introduction, a specific section is called “materials and methods”. All scientists know, in fact, that the results of any measure depend on the instrument used, its technological limits, as well as the limits of the methodology itself and the experimenter’s expertise. Of course, this volume is not a scientific paper or a strictly scientific publication, yet **the attitude** should have been the same, marked by the rigor of the exhibition and **the possibility of carrying out further checks and comparisons in the future**, with the works on display and with others.

In the short essay of Petra Mandt, co-editor of the volume, “Notes on the examinations”, the analyses carried out on the 24 works are listed, specifying that “the examinations followed the international standard for authenticating artworks and were conducted with the support of numerous partners”¹. They can be divided into three stages:

1. Non invasive exams: photographic documentation recto and verso, including “normal light, raking light, transmitted light, and UV light”; Infrared reflectography (IRR); X-rays radiography (RX);
2. Optical microscopy, used also to choose the “possible locations for taking microsamples”, which are “determined and documented”;
3. Analyses on (micro)samples “to analyse the fiber, pigments, and binding materials used in each work”, preparing “cross-sections of paint”: FTIR and Raman spectroscopies; SEM-EDX microscopy; Py-GCMS; 14C analyses².

¹ The partners cited in note 3, p. 163, seem to cover only X-rays, fibre analyses, IRR imaging, Raman spectroscopy and 14C analyses, among the set of exams listed below. It is not always clear who made some analyses.

² 14C analysis is included by Mandt into this group, but it is a dating exam, not made on a cross section. Besides, it is not clear if it was made also on the sample of paint or on the supports.

These are among the most used analyses to examine a painting, although other useful ones are missing³ (such as IRC and TIR, optical microscopy in visible light and UV on cross-sections, non invasive spectroscopies like XRF and FORS that allow a more complete and easy exam of about all the coloured areas) and some of those mentioned are not well specified (for example the types of UV analysis performed, or the IR bands used for IRR).

I believe that the volume lacks, on first, a more detailed premise about the working method addressed in this important study, which clarifies the methods used in the analyses carried out, the priorities and the instruments used. One assumes that that the people involved in the analyses –restorers and scientists– worked with competence and responsibility, but more information would be needed in this kind of studies and publications.

In fact, an overall table of the analyses carried out for each painting is missing (were all these analyses performed for each painting? Were the same analyses carried out also on the paintings used as a reliable comparison from other collections or from the same?), or at least dedicated notes in each entry⁴: in a similar case this specific attention would have been very appropriate. There is also no necessary indication, for the public of non-specialists (including art historians who obviously are not scientists), about the limits of each performed analyses, which depend –it should be remembered– on both from the diagnostic methodologies and from the instruments used. Only for the five paintings by Larionov and Goncharova considered in the catalogue the type of analysis performed is known, due to the diagnostic reports fully published in the RARP webpage dedicated to “Larionov and Goncharova Works from Museum Ludwig Collection”⁵.

All the more reason a rigorous and well explained approach would be implied by the subtitle “Questions, Research, Explanations”.

We do not doubt that all the necessary examinations and documentary checks have been carried out, but it is simply not clear to the reader what has been done on each work, except for the results mentioned in the catalogue entries and for what is presented in the exhibition, whose explanatory panels and whose captions (written in German) are collected in English translation in a useful booklet that can be taken free of charge during the visit of the exhibition. It should be noted that this booklet also includes some additional information with respect to the catalogue, and that some additional images or technical graphics are present in the exhibition and not in the catalogue.

About the results of the analyses presented, a specialist reader notes that the visual evidence of many crucial analyses is missing: images under the microscopes (only one cross section is published in all the book, p. 82), spectra that demonstrate what is affirmed (only one 14C curve is published, for Suetin, p. 72, but not for Kogan⁶; only a couple of spectra are illustrated, both important FTIR results regarding synthetic fibres detected in the canvases of Redko, p. 85, and Rosanova, p. 88), any indications of the

³ For a more complete sequence of diagnostics see next chapter.

⁴ Also, in some general catalogue of museums the performed analyses are indicated with proper acronyms (see in Italy, for example, the General Catalogue of the paintings of the Pinacoteca Civica of Vicenza).

⁵ <http://www.rarp.org.uk/our-projects/scientific-art-analysis-works-goncharova-larionov-artworks-collection-museum-ludwig/art-analysis-research-concludes-analysis-group-paintings-leading-russian-avant-garde-artists-museum-ludwig/> (last consulted Sept. 20th, 2020).

⁶ The 14C curve for the painting attributed to Nina Kogan is presented in the exhibition, yet.

sampling points (in the case of painting or canvas samplings, ...) and certification that the sampled points/areas were not affected by restorations or pollution of the sample. It is clear that not everything can be documented in a similar volume, which is also the bilingual catalogue of an exhibition, but perhaps a little more effort would have been made, dedicating more pages to the volume, i.e. transferring the English translation to another volume, or online in an e-book version, where even the images could have been reproduced in the relative texts, as in the German version (another solution would have been the German version on the left column and the English one on the right⁷). Or an online version of the in-depth diagnostics could have been created for a more specialized audience.

So, adding more pages to the catalogue or an online appendix would have allowed to publish more results of technical exams made on the 24 paintings of the Ludwig Collection (including the 5 Larionov and Goncharova works yet studied inside the RARP project) and on the works of certain attribution chosen for comparison, some of which are present in the exhibition⁸. The analyses on certain works are obviously useful in order to acquire a technical database on each artist. Of course, it is important that the same set of examinations be carried out on the paintings, with instruments that are identical if not at least comparable, having shared the diagnostic parameters with colleagues from the other institutions involved.

More space or an online appendix would have also permitted to share more details of some/each painting like the photographs of the back, some details, etc., useful to the scientific community.

2. On scientific analyses for paintings

The scientific analyses that can be performed on paintings are generally carried out (or should be carried out) according to some rules, first of all of order:

- A. non-invasive analyses, starting with imaging exams (A.I in the following scheme) and continuing with the spectroscopic ones (A.II);
- B. invasive analyses, starting from the micro-invasive ones carried out on samples.

Of course, the purposes of diagnostics can be the most disparate: some related to the knowledge and deepening of conservation problems and perhaps functional to subsequent restoration interventions; others to the study of painting technique as an end in itself (building a technical database on an author, for example); finally, others linked to themes of authenticity.

⁷ Some strange editorial choices derive from splitting the German and English text: for example in the English translation of the files dedicated to Suetin the translation of the introductory part (p. 174) is placed before the entries of the two paintings without any title, without being divided from the previous entry dedicated to Matevich, differently from the German version (pp. 68 and 70).

⁸ Curiously, the works considered authentic and those discussed or judged to be inauthentic are not exhibited in the same way, with equal dignity: the former are always presented in the frame, the latter unframed. It is true that without a frame the characteristics of the painting at the edges and of the canvas are better appreciated, but this also applies to the edges of the comparative works.

In the latter case, i.e. the verification of the authenticity of the work of art through scientific analyses, these require particular rigor and experience and -an important issue- may not always be necessary (if there are incontrovertible documents, for example) nor sufficient.

The technical-scientific examinations are not sufficient, but they are still important, if they do not offer sure holds for dating and for verifying the compatibility of the executive technique with that known by the artist. In fact, if the analyses identify pictorial materials (pigments, binders, supports) and executive procedures used for quite long periods, an exact determination of the age of the work is impossible, also taking into account that an artist may have preserved some materials (such as tubes of paint, for example, or paper, rarely blank canvases) for many years, for decades. Direct dating, by means of radiocarbon or possibly by other methods based on decays of radioactive isotopes, substantially helps as a watershed between works carried out before and after the so-called bomb peak, around 1955, managing to obtain reliable dating of twentieth-century works only after that date.

In many cases it is important to compare the author's technical practice on the basis of safe and dated works, also knowing what the technical variability is, i.e. taking into account the experiments that the author may have done, also considering his place and working environment, as well as his circle of colleagues and friends. Obviously, these are in-depth studies that require the contribution of extremely competent art historians regarding the individual author and free of prejudices, even with regard to analyses.

Let's see in detail the what we can consider the most appropriate order of the analyses more diffused and suitable for examining the paintings for authentication purposes⁹.

A. Non invasive analyses

I. Imaging exams:

1. Photographic documentation (recto and verso) using a visible light source, including raking light, details, borders, transmitted visible light when possible;
2. UV Fluorescence (UVF) and, when useful, Reflected UV (UVR) using a digital camera with proper filters and proper UV source (generally with 365 nm peak emission). Used to see the problems related to the surface and varnish, and their integrations, sometimes can give info about the pigments, depending on how they react to UV radiation;
3. Light induced fluorescence (LIF) and Visible induced luminescence (VIL), using proper cameras, filters and visible light sources, to identify the presence and distribution of some pigments like Egyptian/Pompeian blue;
4. IR reflectography (IRR) performed in different bands, to collect info about conservation issues like retouches/repainting, and visualize underdrawing, changes and previous versions behind the surface (bands: typically 0.8-1 μm

⁹ On this argument: Gianluca Poldi, Giovanni C.F. Villa, *Dalla conservazione alla storia dell'arte. Riflettografia e analisi non invasive per lo studio dei dipinti*, Edizioni della Normale, Pisa 2006; D. Pinna, M. Galeotti, R. Mazzeo, *Scientific examination for the investigation of paintings: a handbook for conservators-restorers*, Centro Di, Firenze 2009; Ingeborg de Jongh, Milko den Leeuw, Jennifer Mass, Daniela Pinna, Lawrence Shindell, Oliver Spapens, *Technical Art History. A Handbook of Scientific Techniques for the Examination of Works of Art*, Authentication in Art Foundation, The Hague 2018.

with a modified digital camera and 1-1.7 μm or 1-2.5 μm using specific cameras or IR scanning devices; other systems like multispectral IR scanning devices are also used, depending on the research institute and on the goals of the campaign);

5. Transmitted IR (TIR) when possible, particularly interesting also for lined paintings, allowing to see some kinds of writings hidden between the canvases;
6. False Colour IR (IRC or IRFC) and also False Colour UV (UVC or UVFC), combining different IR, visible and UV bands allow to better distinguish restored areas and the surface distribution of some painting materials;
7. X-rays radiography (RX), to better understand some technical issues like the brushstrokes, to visualize non-uniformities in the painting layers and in the whole object (like metals, nails, inserts, etc.), the presence of chemical elements with high atomic weight, some kinds of underdrawing detectable by RX, changes, previous versions and re-uses of the support.

II. Spectroscopic exams:

8. In field Optical Microscopy (OM), possibly with different magnification (ab. 50x and 250x), to examine the surface and borders, visualize retouches and conservation problems, clarify some structures of the painting film, etc. Important to choose the proper points to carry out the analyses listed below;
9. Reflectance Spectroscopy (RS or FORS), very important to easily detect various pigments of the outer layers, like blue ones, some greens and others. Colorimetry (CM) data related to RS, if needed;
10. X-Ray Fluorescence (XRF), to deduce the presence of metals and of various inorganic pigments from the identification of the chemical elements present (not light elements). It can also be performed using a scanning device on macro-areas (MA-XRF), also called XRF-mapping;
11. Vibrational techniques like Raman and FTIR, both extremely effective to identify organic and inorganic pigments, FTIR also potentially useful to detect binders, varnishes and other substances, both with limitations due to some factors –specifically when used *in situ*;
12. Fluorescence spectroscopy (FS), useful to characterise some materials like some organic dyes.

B. Invasive analyses¹⁰

I. Microscopies and spectroscopies:

1. Optical Microscopy on cross-sections with diffused visible light and UV light, in order to visualize the different painting layers, inclusions, pigments, etc. Also used on canvas samples as they are to discover artificial fibres and on wood samples from panels to determine the wood specie;
2. a. Scanning Electron Microscopy (SEM) on cross-sections coupled with EDX spectroscopy (also called EDS) or EDX-mapping, useful to better distinguish some layers and materials, detecting some pigments or inclusions by their chemical elements read by electron-induced X-rays spectroscopy. It is also needed on canvas samples as they are to discover artificial fibres, to study paper and other materials;

¹⁰ They can be micro-invasive analyses, if possible, meaning that very small samples are generally needed by modern investigating methods.

- b. Micro-XRF mapping (μ XRF) on cross sections or directly on samples, as possible alternative of 2.a;
- 3. Micro-Raman (μ Raman) spectroscopy on cross sections (better) or directly on samples, to better identify organic and inorganic pigments/dyes and their forms (polymorphs);
- 4. Micro-FTIR (μ Raman) spectroscopy on cross sections or directly on samples. Effective to identify organic and inorganic pigments, also useful to detect binders, varnishes and other substances. Used on canvas samples to characterise the fibres, including artificial modern ones;

II. Separation techniques:

- 5. Gas chromatography (GC) and associated techniques GC-MS, Py-GC-MS, GC-FTIR, to characterize binders and organic substances such as oils, waxes, glues, amino acids in protein binders, resins, polymers (plastics);
- 6. Liquid chromatography (TLC), HPLC and HPLC-MS, to identify organic dyes, dyes, synthetic organic pigments, natural and synthetic resins

III. Nuclear methods:

- 7. Radiocarbon (^{14}C) dating, with limitations regarding modern paintings (from 17th to 20th century), sampling the supports or the painting layers can distinguish works produced before the bomb-peak (1955 ca.) or later. More than one sample is suggested;
- 8. Isotopic ratios of lead, caesium and strontium.

Of course, other analytical methods can be used to solve or try to solve some specific issues.

3. Notes on single paintings

Liubov Popova, *Painterly Architectonic* (inv. ML 01308)

The painting on canvas *Painterly Architectonic* (pp. 54-57 and 167-169), generally dated ca. 1920, but dated 1918 by Sarabianov and Adaskina 1990¹¹, is indicated as “former attribution” to Liubov Popova.

The link between this painting and the painting with the same aspect and very similar size belonging to the Thyssen-Bornemisza Collection in Madrid (inv. 1976.17), signed and dated “L. Popova, summer 1918” in Cyrillic on the verso, is evident. In fact, the paintings are reproduced together in the catalogue and also both exhibited.

The photographic reproduction of the Ludwig version (p. 54) is not of good quality, with a reflection on the left showing the texture of the canvas and altering its appearance (colours) a little¹².

¹¹ See Claudia Gerner-Beuerle, *Vergleichende Studien zur Maltechnik von Ljubow Popowa, diploma theses*, FH Köln, 1999, unpublished), pp. 73-78 (in the catalogue, p. 168, note 9, different pages are cited, that refer to another painting, ML 01526).

¹² The painting was better reproduced in *Der Kubofuturismus und der Aufbruch der Moderne in Russland. Russische Avantgarde im Museum Ludwig. Band 1*, Katia Baudin (Herausg.), Katalog der Ausstellung (Köln, Museum Ludwig Mai-Dezember 2009), Wienand, Köln 2010, p. 20.

The following issues are discussed in the catalogue entry and can be further commented:

- No signatures or numbers appear on the verso, so the painting doesn't appear in the lists compiled respectively by Popova (in 1921) and by some colleagues (in 1924, after her death). Some questions about this point can arise: is the stretcher the original one or it was substituted? Could the original stretcher have these writings on it? Unfortunately, no photo of the reverse is produced. Is it possible that the painter, satisfied or unsatisfied by the result, could have sold or donated the painting short after its execution, without registering it in the list?
- The presence of a "red ocher ground" is "a deviation" from the fact that "all the previous examinations of paintings known to be by the artist have established that white grounds were used" (p. 168). Both the researches of Gerner-Beuerle¹³ and Grenberg et al.¹⁴ are cited in note, but the opinion of the first about this painting –i.e. that it can be considered authentic– is omitted. Of course a coloured ground cannot be a proof of inauthenticity, because such an exception could happen: for example, the artist could have experimented a different ground for a second version of the subject (if this were the second version). We can point out that in some paintings by Popova in public collections different colours (differentiated priming?) exist under diverse coloured shapes, like in *Painterly Architectonic* of the National Galleries of Scotland (1916) under, and we ignore whether it is due to an overall rethinking or as an effect sought. A similar evidence can be partially noted at naked eye under the *Painterly Architectonic* of the Thyssen-Bornemisza Collection (1918; inv. 1977.52).
- The Ludwig version is painted with brush, while the Thyssen-Bornemisza version shows some first greyish layers painted with the brush, while the last layers are applied with a knife in a peculiar way that allows the paint to rise and wrinkle with a wavy effect. The Thyssen-Bornemisza version appears to be more complex in texture, as other Popova's works of that year/period, but we also know that she painted other works only using the brush, without evidence of the knife: can we confidently believe that the artist herself did not want to create two similar but different versions of the same subject, in order to try and verify diverse approaches to painting practice, perhaps after a short time? No other scientific exams (14C, spectroscopies, fibre analyses) that can state a different dating for this work are published (were they made?), no other documents, so we cannot exclude this question. Unfortunately, no scientific data about the Thyssen-Bornemisza painting, like pigments used, is provided, to be compared to the Ludwig version.
- The proposition "Although Popova worked through her ideas in series, there exists no other example where she repeated, almost exactly, a painting in size, composition, and color" (p. 168) seems to contradict what written in the previous catalogue entry, where two similar paintings by Popova are shown. They are *Seated Female Nude*, 1913-1915 (105.5 x 86.5 cm, Museum Ludwig, p. 50) and *Air+Man+Space*, 1913 (125 x 107cm, State Russian Museum, St. Petersburg, p. 51), one very similar to the other.

So, the conclusion of the technical entry seems too rushed.

In this technical contest, where scientific data –until proven otherwise– didn't demonstrate the incompatibility of the painting with the presumed period, is the statement "former attribution", that opens the catalogue entry (p. 167), correct?

"More investigations will be done to clarify the age of this painting" could have been a good temporary end for this entry.

¹³ See Claudia Gerner-Beuerle, *Vergleichende Studien...*, cit.

¹⁴ Uri Grenberg, Svetlana Pisareva and Irina Kadikova, *Anatomy of Russian Avant-garde: View from the Lab*, Moscow 2017, pp. 112-120.

Other paintings

In this kind of projects regarding attribution, it is very important to distinguish the conclusions – like change of period or of attribution – derived from analytical results, from documents and from stylistic reasons. Each datum should be carefully examined, yet the first two issues are typically stronger, while considerations regarding the brushstrokes, the underdrawing, etc. can be relevant but not always probative.

Particularly strong analytical results concern the post-dating due to dating methods (radiocarbon, ...) or due to materials that are not coherent with the declared/supposed age of the object.

A synthetic **table**, attached, sums up the key points presented in the single catalogue entries and their limits.

About the title

In the frame of this review a small but not insignificant place regards the title of the catalogue. The word “fake” is strong and attracts the public and the press, but it is a term that in this context, considering that it comes from an institution, is not entirely correct, since even for the works of incorrect dating or attribution, a fraudulent intent cannot be determined, as neither for the sale of the same.

A forgery depends in the intention of the author and/or of the different actors of the “market” (meaning owners, sellers, buyers, art historians...): a copy of an artist’s work is not necessary made with the intention of deceiving, in many cases – as happened for centuries – it can be an academic exercise not meant to be confused with an authentic work of that artist. But the confusion happened. A proper discussion about the meaning of the terms “fake/forgery” would have been expected in the book, for instance in the essay about legal aspects written by Friederike Graf von Ertihi and Ruth Lecher (pp. 197-203), but there isn’t.

So, “questions of attributions” or “investigating the authenticity” would have been a more precise title in this context, in this project.

4. Conclusions

The catalogue, and also the related exhibition, lacks a detailed presentation of the analyses performed on each painting and of the instruments used, the indication of the measurement and sampling points and a wide discussion of the scientific data acquired. Some analyses are missing, too, like 14C that can be useful in some cases.

Some catalogue entries don’t support conclusions based on strong technical data, nor offer proper explanations based on wide comparisons, also regarding the fields of stylistic observations and historic research.

Besides, the figures of the (great!) collectors Peter and Irene Ludwig are completely neglected. It seems to be a bad service done to these acute connoisseurs, for which one

would have expected a reflection in the catalogue on the methods of their acquisitions, their taste and how they observed the paintings, their criteria and “the state of the art” of knowledge about the Russian Avant-garde works and artists in the years they collected the paintings examined. In fact, Peter Ludwig had a PhD in art history and his intention was to create not simply a large collection, but a museum.

A large museum is also a place of collaboration with other important international institutes, and perhaps the consultation of a significant institution in the field of Russian Avant-garde and analyses such as the Russian State Art Museum – probably the best research facility in the world on Russian art – would have been appropriate, and we do not know took place.

As a scientist frequently involved in the scientific analysis of old master and modern paintings and in research teams, I would have expected that the Museum of Ludwig, with that name and collection, to take this opportunity to chart a path of impeccable precision that could guide other public and private collections as well. Unfortunately, this is not the case. The feeling is that a precious opportunity has been lost.

Milan, 28th October 2020



Gianluca Poldi, PhD

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He taught in many Universities, directed the scientific area of the Master in Conservation Science for paintings (Verona), collaborated for some years with the University of Milan and now teaches at the State University of Bergamo. He founded in 2005 the Laboratory for Non Invasive Analyses on artworks of the University of Verona (LANIAC), then since 2008 he cooperates with the Visual Art Centre (CAV) of the University of Bergamo.

The main focus of his research activity deals with non invasive examinations, performed with portable instruments, to study polychrome artefacts of various kind and age, palimpsests and drawings. He is particularly interested in the joined use of different technologies, non invasive and invasive ones, and in the dialogue between scientific and humanistic competences.

He has been consultant in many projects regarding conservation science and carried out examinations on many hundreds of artworks in Italian and European museums and collections. He has been in the board of the Italian Association of Archaeometry (AIAr).

He also conducts a free-lance activity collaborating with private restorers, art historians, Soprintendenze, auction houses and for projects regarding scientific catalogues and exhibitions where analyses can have a complimentary role.

He performed many broad campaigns on works by Andrea Mantegna, Ferrarese School, Antonello da Messina, Giovanni Bellini and his workshop, Cima da Conegliano, Bramantino and Lombard school, Leonardo da Vinci's drawings, Giovanni Santi, Giorgione, Titian, Lotto, Jacopo Tintoretto, G.B. Tiepolo and others up to Boldini, Segantini and Divisionist painters, Boccioni, Depero and Italian Futurists, Modigliani, Carrà and de Chirico.

He published more than 200 works including essays, books and scientific papers.