

# A RT AND SCIENCE: A MUCH DEBATED TOPIC

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## 1. The sciences and their applications

Art and science undoubtedly continue to be subjects for confrontation, debate and discussion, either upholding positions or opening up to new ideas, a situation that has persisted over time among scholars, researchers, and operators with various backgrounds and cultural and scientific skills that have been acquired over many years through professional experience [1].

The intent of this work concerns the above-mentioned issues and looks at some written articles published at different times, by analysing them and also taking into consideration the different environments and situations inherent to the research conducted on various themes of a scientific and artistic nature.

Therefore, the objective of this research is to examine these concepts and arrive at the observation that there is a relationship between art and science, and that they are characterized by a common truth. It is therefore considered appropriate to initially examine science and the applications that represent it.

An integral part of our life and the assumptions underlying it are inextricably linked to the way we conceive the world and the way we see ourselves as part of it. In a scientific context, method, together with the contribution of those who determine procedures for the peer review or double-blind evaluation of scientific articles, is fundamental in reaching a final judgement that is objective and reliable.

But it is not only method that establishes scientific objectivity, because simply looking at documentary sources is enough to realize that scientific method has always been closely linked to the times, places, and evaluators who have exercised this practice case by case. This has meant that some historians, philologists and philosophers have reduced the history of science to a mere piece of news, to anecdotes chosen to support this or that theoretical model, depriving it of its ability to interpret, as well as to account for the past.

The historical approach to the scientific task suggests a different answer, just as there is no single answer that can be attributed only to science, neither is there one that can be attributed only to history. Indeed, up until a few decades ago, scholars tended to be presented with extensive, all-encompassing historical views. This approach has recently changed due to the greater amount of information available to us and the new ways of viewing sources: we have started searching for science where we used not to look for it before and, what is more important, the questions that histo-

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rians try to answer have changed to involve a wider segment of people. Hence, the intent is to present a science that has interacted across the centuries, through the culture and society of the time. Special attention is paid to the visual aspect of scientific culture. Understanding the nature of a work of art, in fact, means being able to identify links, relationships and processes that were previously hidden. Emphasizing the visual aspect of science is also a way of remembering the material nature of scientific knowledge: science is not only in the minds of its creators or in the equations that translate it onto paper, but also in the instruments of those who practice it every day and are developed by researchers to build stronger relationships.

Ultimately, if we want to give a complete and reliable answer by accepting and learning about the different ways in which different cultures have made new discoveries, science, history and art and, therefore, method, must offer a picture that is humanly and scientifically unique and synergistic [2-7]. The well-known Italian art critic Giulio Carlo Argan [8] stated that:

*"All works of art are artifacts but not all artifacts are works of art. It is judgement that recognizes artistic value. However, it is not formulated based on given parameters, nor is it the expression of the aesthetic pleasure or the emotion that the work arouses in the viewer. The legitimacy of the judgment depends on the mental process through which the method is achieved."*

## 2. The relationship between art and science

In view of the above, let us now examine the relationship between art and science in more detail. Over the years, art and science have each developed independently, resulting in a completely distinct and selective way of treating their experience of the world, each pursuing its own objectives and interpreting its own results. Without going into the merits of issues concerning historical-artistic research, it is important to highlight the delicate thread that connects historical research to experimental research relating to technical disciplines, such as chemistry for restoration, conservation and treatment of materials, environmental chemistry, physics and biology. In recent decades, significant progress has been made in all these disciplines including the specific area of heritage conservation. The theory, which forms the ethical basis for these disciplines, becomes sterile if it dismisses the experiments conducted by science. Nevertheless, the term experimentation should not lead us to believe that heritage should be considered a testing ground. Being aware of the pointless — even harmful — controversies that are easily triggered when dealing with these topics, the need for old issues to be addressed from new points of view is a necessity. They must, of course, be advantageous for heritage protection, understood essentially as learning about and respecting that specific reality which, as a unique and exceptional material testimony of cultural evolution, is always contained in a work of art. It is therefore a question of providing new interpretative keys which must not replace the artefact, but act as tools, as a means, and should not be the sole aim of the research. It is a somewhat enterprising task to be faced, but one must always remain humbly aware of the essential importance of the contribution of other disciplines involved in the research [5,6,9,10]. Here, it is evident there are two souls.

On the one hand, there is a clear conviction that science and literature are merely two different ways of exploring reality and making sense of it. On the other, the scientist's *forma mentis* is unequivocally that of a science expert who loves precision and rigor. The result is a sort of inner dialogue on the different activities of the spirit, and their

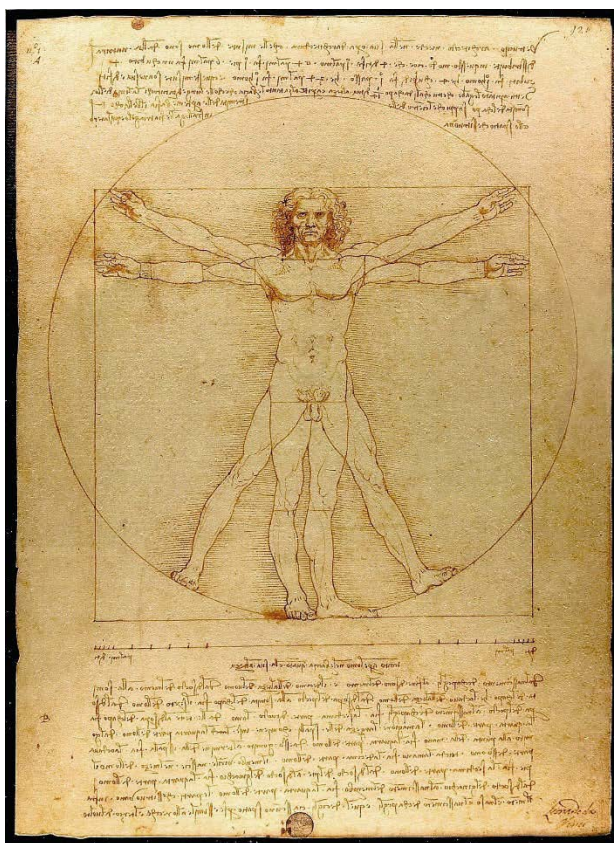


Figure 1. Vitruvian Man by Leonardo da Vinci  
(Source: WikiCommons).

nated by them. Another aspect is that of the relationship between scientific knowledge, curiosity, wonder and even amazement. The various testimonies, which often take on the tone of a confession, place scientific enterprise within the spiritual context of admiration or even turmoil, which anyone may experience in the presence of creation. The *primum movens* which prompted us to write this article was a certain inferiority complex and a sense of reverence that characterizes contemporary scientists. The result, however, is an incontrovertible demonstration of the fact that those most genuinely enamoured of creation are scientists. Loving does not necessarily mean knowing how to understand and decipher but loving so passionately as to rise to a higher form of understanding [11]. This is the way to read reality. First, let us consider a statement which relates to life in general, but may relate, more specifically, to cultural and environmental heritage: "Our past is also part of our future through our present". This can be applied to art, because the different ways in which art is conceived, expressed and produced are all inter-connected, as well as being connected to history. A second affirmation is that art and science are two different but complementary ways of reading reality. The concept of reading reality is extremely important both for us and for the study of cultural heritage.

different affinities and specificities. The relationship between these two souls - mistakenly considered to be in contrast with each other - is visible in the works of Leonardo da Vinci, which are considered from the perspective of both art and science (Figure 1). Of course, it is true that both scientific research and artistic production involve creativity, and it is equally clear that scientific research is expressed in a continuous and progressive way, intrinsically without an end and without a center of gravity, while every single act of artistic creation, when it is truly such, constitutes a universe in itself; it is autonomous, perfect and enclosed within an eternal present. From this observation arises a sense of inferiority that the scientist feels towards the artist, so that he is increasingly driven to make forays into literature, the arts, philosophy, faith or ethics and to be contami-

Reading is synonymous with knowing, interpreting and evaluating works of art: all are actions carried out by historians through subjective evaluation and by technicians through objective evaluation. This duality, linked to the fusion between art and science and their mutual need of each other, represents the heart and soul of the study of cultural heritage [12, 13]. All the above highlights how the scientist and the artist can coexist, without the one prevailing over the other, and how it is possible to achieve results and reap successes simultaneously in both fields. Therefore, one can say that art and science are two ways of narrating the history of the world, not two contrasting subjects, but two different complementary ways of reading reality. It is evident that education and research play an important role within this interdisciplinary context of art and science, in that they are considered to be part of the system: *artifact-environment-biota*, and have the aim not only of protecting artifacts, but also safeguarding human health and natural environments by following a precise methodological path. In this respect, the World Wide Fund for Nature states, "Nature does not support the human footprint, that is, the human footprint is superior to regenerative abilities and receptive to natural systems and here, the keyword is eco-sustainability". Together, the different synergistic scientific experiences and skills are, therefore, essential for the good of cultural heritage. Interdisciplinarity is necessary to train, teach and educate professional figures in this specific sector to respond to the needs of the employment market and the quest for internationalization in the scientific field. The cultural significance originating from art and natural heritage goes far beyond local and national borders, it requires involvement and participation in its role of acculturation, joy, contemplation, enjoyment, sadness, pathos and enthusiasm [14-16].

Science itself is often considered to be art, as demonstrated also in the various themed competitions worldwide: as an example, Figure 2 shows the photo of a sugar crystal exposed to polarized light taken with a microscope by Dr. Diego García; the photo was published by National Geographic in 2023.

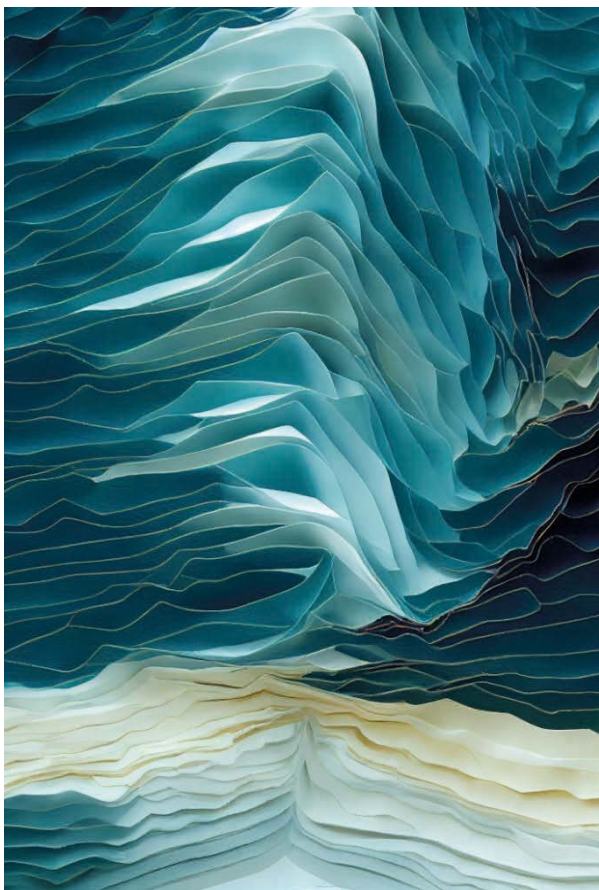


Figure 2. Crystallized sugar exposed to polarized light, photograph by Dr. Diego García, Nikon Small World.

### 3. Truth: a meeting between art and science

There is no doubt that nowadays - often dominated by monographic reconnaissance and approximate sociology - discussing a work of art is not a literary exercise, as the art historian Roberto Longhi professed, nor a starting point for developing theories, as other art historians such as Venturi and Argan sustain. Instead, Federico Zeri claims – while criticizing those previously mentioned - it is a matter of observing, of giving back the presumed truth of the artistic text, of revealing the unexplored, of attributing mastery, of rigorously frequenting archives. Hence the need for dry prose. Besides, since forms do not have an autonomous life, art and society must be given the opportunity to dialogue with each other in order to contextualize them temporally, as well as to study normal everyday objects. There is then, in relation to the relationship between truth and art, another aspect that leads back to the now concrete possibility of reproducing a work of art or creating one using computer-based methods [17]. In this regard, it should be noted that virtuality and reality constitute two dimensions, two worlds, which seem to be in contrast, but which can explain something about each other and allow access to different interpretations. If we discuss virtuality, our thoughts lead us to the corresponding subject matter that can influence and make us question what a problem of authenticity is, because we are unable to distinguish the real from the reproduced and are consequently open to various questions about the identity-related values of a work of art. Is identity something material and immutable? Or is it the result of a dynamic evolution in which "the same" continues to persist in the "other"? How can "the old" and the "new" or "the real" and "the reproduced" integrate without altering the entity of the "cultural asset"? Figure 3 is the "personal" interpretation of Leonardo da Vinci's Vitruvian Man (shown in Figure 1) provided by "Dall-E<sup>®</sup>" Artificial Intelligence (AI). The command given to the AI was "generate your interpretation of the Vitruvian Man based on your tastes". It might be said that AI has "tastes" or "preferences", but, basically, it depends on how it has been trained and on the personal tastes of its users that can alter the final output. Artificial intelligence is not creative but reproduces and interprets the data with which it has been trained. So how do you compare the identity of the second image with the original? Clearly, it is not a simple reproduction of something old or real, but neither is it something new; it is the result of an evolution that is debatable as to whether it can be considered art or science. However, it is equally true that there are also commercial interests linked to the dilemma of the real-virtual. The reference here is to contemporary art recognized by critics as being a great phenomenon of commodification and speculation, far removed from real figurative interests, even though very often, authentic values are then discovered and remarked upon at a much later date. The relationship between truth and science is addressed by the palaeontologist Henry Gee. According to the scholar, – and we authors are of the same opinion - the goal of scientific research is to discover what is possible and not yet known. Science must choose uncertainty, constant self-correction and, in doing so, accumulate increasingly reliable knowledge, starting from the exercise of systematically doubting things. This sceptical thesis is liable to be misunderstood by some, in the consideration that it is a demonstration of its weakness and not its strength. In fact, there is no doubt that science is the only form of knowledge in which the question marks increase rather than decrease over time, posing the axiom that: "The more we know, the more we know that we do not know". This is what is vehemently and at the same time humbly pointed out to those who — as mentioned before — misunderstand, emphasizing a truth that reflects the bare facts and contradicts them.



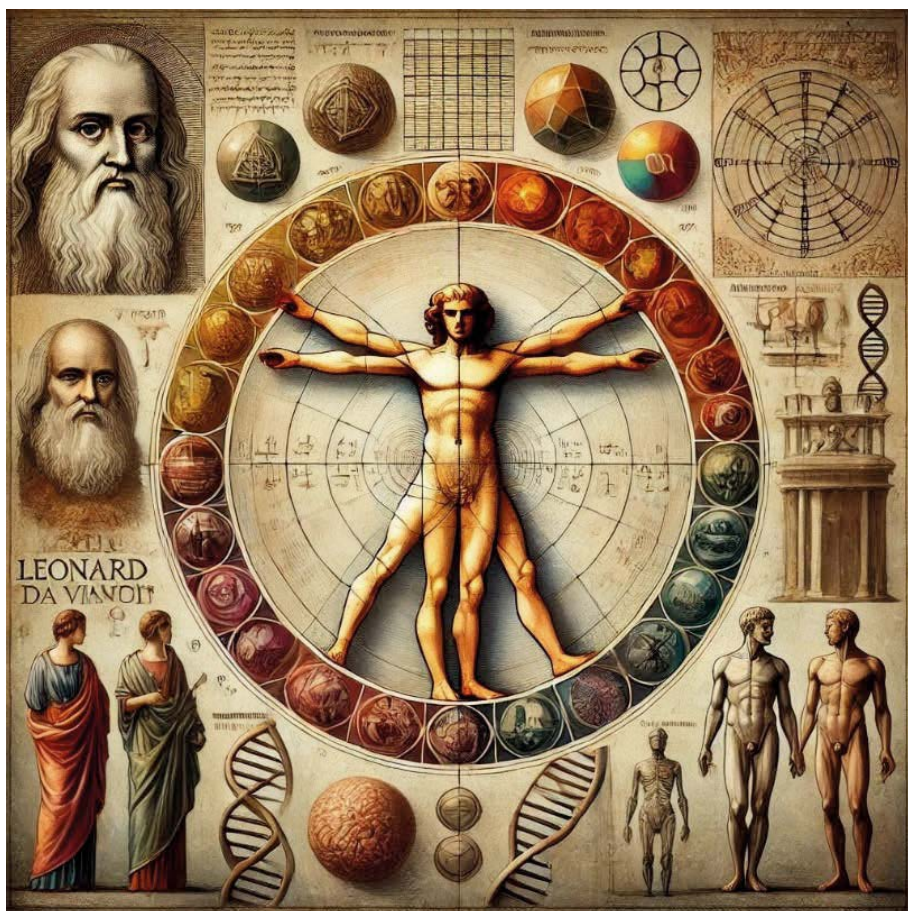


Figure 3. Vitruvian man as imagined by "Dall-E®" Artificial Intelligence Image Generation tool.

It follows that the relationship between art and science must be based on the concept of truth which must necessarily be present, and distinguish the methodological paths used in both. This commonality of intent manifests itself in a mutual need and an integration of methodologies, so that results can be compared in order to finally arrive at a scientific truth. This is a reference to a very topical theme in the field of art and science concerning the attribution of a work of art which, in relation to what has been reported, necessarily needs the previously underlined comparison and integration to be carried out. In this regard, a subjective evaluation of a historical, aesthetic, stylistic and iconographic nature, combined with an objective evaluation, using diagnostic-analytical technologies, can arrive at a result supported by both the art historian and the technician, allowing the correct, complete and, therefore, reliable scientific truth to be achieved. The question of authentication, moreover, also implies identifying a real work which is different from a virtually reproduced work. This highlights even

more significantly, the importance of the instrumental eye, which complements the human eye, so that the 'nakedness' of the work of art under investigation, synonymous with knowledge of the materials and products used for its realization, is evaluated. Indeed, characterization of the material components, compared with what is historically known of the object under examination, combines with this knowledge to confirm and support the truth.

It is a fact. In general, materials and constituent products are assembled according to a specific artistic technique, while other iconographic and iconological contents and expressive values are transmitted through the material and are inextricably linked to it [18-20]. There is also another aspect that is mentioned in the context of the truth that unites art and science. As in economics, the three S's (scale-scope-spillover) can be applied to art and science (Figure 4):

1. Scale, i.e. the dimension that serves to aggregate resources to stimulate demand.
2. Scope, i.e. the ability to have a differentiated portfolio that allows you to better exploit synergies.
3. Spillover, i.e. the multiplier effects of investment in knowledge territorially that stimulate growth according to a virtuous mechanism.

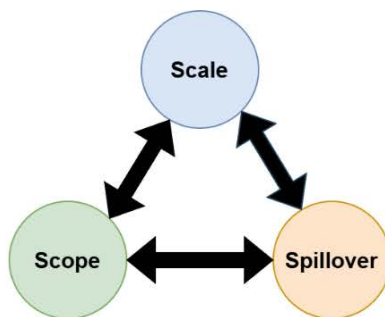


Figure 4. The three S's.

These benefits together with their coordination give rise to research that is reliable and competitive.

#### 4. Thinking independently and together: the emblematic example of the relationship between art and science in the Journal "Conservation Science in Cultural Heritage"

Different ideas, one goal. The meeting of various experts, with different independent scientific backgrounds and skills, each with their own ideas and convictions, offers a wide choice of methodologies and strategies that can help to diversify training and education in the various human and experimental sciences but, if aimed synergistically at a final, common goal, can lead to achieving the right results. This not only allows the expert involved in historical-scientific investigation, but also the young neophyte, to respectively confirm and choose their specific inclination towards a corresponding scientific area. On the other hand, everyone must have the same chance of being evaluated on merit and it is a fundamental condition to kick-start the process from a scientific point of view. It is evident that one, instinctively, mainly relates to similar people or those with the same background, but it has been shown that in the long term the absence of diversity can produce partial or, what is worse, incorrect results. The focus is on young people because if what has been said is missing the result is not only a scientifically incomplete education, but also difficulty in entering the employment market. "Interdisciplinarity", therefore, comes from experts in various scientific areas: this is the term that can be traced back to the intent with which the historical-technical journal "Quaderni di Scienza della Conservazione" of the University of Bologna was opened in 2001. This is how a project, that determines a sense of scien-

tific community around it, was created. The idea was to replicate Prof. Walter Ciusa's model and pattern for the journal "Quaderni di Merceologia" which he founded in the sixties at the same University. As a result, many questions were posed by colleagues and opponents interested in understanding how an idea with these characteristics could be realized and which also included a global vision; in other words, a journal that would continue through the years based on ethical values that were scientifically and financially sustainable. Amidst the manifest impediments, there were comments such as "Those who work with this intent in mind have something that today is difficult to achieve, but the different skills, synergistically, are undoubtedly fundamental in achieving the corresponding objective" [21-22]. Those who deemed the project to be unfeasible did not listen to my reasoning: it was essential to be courageous, daring and, above all, curious. Hence, over the years and, in 2007 when the Journal was renamed "Conservation Science in Cultural Heritage" it adopted "internationalization" as its second key word: that is, the adhesion of researchers belonging to different schools and countries at an intercontinental level who have shared and continue to share the intent mentioned above, by submitting an ever-increasing number of scientific contributions and respecting those values that distinguish the truth in art and science. Respecting this truth is possible, owing to a new enlightenment that also contemplates a culture of feelings: if interest and prevarication are forces that move the world, the commonality of intentions and objectives remains wholeheartedly a force to believe in [23-27].

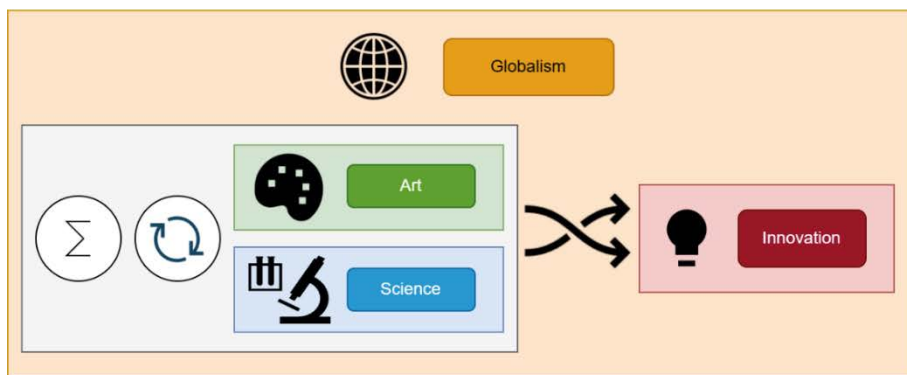
## 5. Globalism in culture

The cultural heritage sector is undoubtedly addressing the changes relating to today's globalized world, so it can act positively for its protection, enhancement, prevention, promotion and communication, using the technological innovations that are constantly emerging. Nowadays, technology is evolving more rapidly than our customary mental processes and to be competitive in the years to come, it is necessary to renew cognitive paradigms. Some suggested guiding principles that may be adopted by both individuals and institutions include risk, which must be replaced by safety; experimentation instead of planning; design that not only focuses on the cultural object and/or artifact, but also on the impact it has on individual networks as well as institutional ones. In accordance with the above, as Giulio Giorello, a philosopher of science says, "knowledge has a rebellious soul", it should be emphasized that the advancement of knowledge brings significant breaks with established beliefs in the production of goods and services, and particularly in science. Those who innovate are winners because the exception does not confirm the rule, it becomes a new rule. The relationship between art, science, innovation and globalization is represented in Figure 5, where it is clearly visible how the innovation required by the contemporary world is not only the sum, but also a repetition of the joint and synergistic activities between the disciplines belonging to the scientific and artistic world and which subsequently becomes knowledge. It should therefore be acknowledged that innovation, far from being temporary and episodic, is, instead, convincing and permanent. It is the result of interconnections between scientific research and technological applications, freeing itself from prejudices, resisting and standing up to unidirectional theory and evaluation criteria and consequently revisiting the certainties and habits of the past. This is how it reaffirms its profound extraneousness to the historically mainstream dogmatic approach which claims to plan scientific development based on lesser known more progressive instances, but which, in a desired system, are inevitably destined to become



the priorities laid down in previous years. This new knowledge in science therefore has a rebellious soul that assumes different tones and different evaluation criteria on a practical level [28-34].

In this respect, it is hoped that the cultural heritage, which represents an indisputable peculiarity for Italy with its 60 protected assets on UNESCO's world heritage list, is exhibited, narrated and enhanced in a global and temporal dimension, as is already the case in several countries, worldwide. A global museum is what is needed for today's increasingly connected world.



*Figure 5. The continuous, mutual and synergistic relationship between art and science is needed for innovation in today's globalized world.*

A museum offers the response to a change in public sentiment, in other words it has a national and global responsibility: a museum of the world for the world. Its central theme will be a link between cultures, not only through exhibiting works of art, but also through showing the life of communities within the universe and as a consequence, their cultures. It is not only a political project - it is also the response to a rapidly changing world. The museum must therefore play its part in illustrating the connection between cultures and our shared humanity and, in this way, contribute to narrating the interconnected history of the world. The goal is to continue to consolidate our place in the center of global culture by understanding and encouraging the interpretation of these world changes. In narrating the story of different objects, the museum will enable cultures and historical eras to be compared. This implies a new narrative for collections with an emphasis on the interconnection of cultures. However, the leap into cultures is also a technological one. Digital technology will play a much greater role in better understanding the interests of visitors and in creating guides and customized tours. Digital platforms allow enthusiasts in all corners of the globe to interact with museum collections, giving rise to social media coverage. It is now possible to connect galleries and museums anywhere in the world using mobile devices.

## 6. Conclusion

By recognizing the close correlation between art and science, and between cultural values and scientific research, it is possible to protect and enhance the heritage of which the community is the creator and as it is not only the habitat and historical

memory of what people have been and how they have been able to interact with matter, it is also a testimony to the evolution over time of a people's spirit and culture - an important message for the future, as discussed in the works presented in the bibliography. In conclusion, it can be said: "Art disturbs, science reassures". From this quote by Braque, as well as experience in the field, comes the following observation: "One thinks, indeed, one is convinced, that the turmoil emanating from a work of art may — or rather, will certainly — require time to be completely metabolized, and to find reassurance in science". Respecting this truth will enable a new humanism to emerge that contemplates a culture of feelings: even if a predominance of interests is the force that moves the world, the commonality of intents and objectives remains a force to believe in.

## References

- [1] Lorusso, S., (2004). Editorial. Arte e Scienza, l'Arte è Scienza. In: *Quaderni di Scienza della Conservazione*, Vol. 4, pp. 11-13, Bologna: Pitagora Editrice. ISSN 1592-6443.
- [2] Lorusso, S., Natali, A., (2020), The synergy between Human Sciences and Experimental Sciences for Protection and Valorization of Cultural and Environmental Heritage: Salvatore Lorusso's Activity in Education and Research, In: *Conservation Science in Cultural Heritage*, [S.I.], V. 19, p 29-68, March 2020. ISSN 1973-9494.
- [3] Lorusso, S., Natali, A., (2007). Lo studio e del "sistema: ambiente/manufatto di interesse storico-documentale", Casi di studio, In: Plossi M.; Zappalà, A., *Libri e Documenti / Le scienze per la conservazione e il restauro*. Mariano del Friuli: Edizioni della Laguna.
- [4] Lorusso, S., Natali, A., (2015). La ricerca storico-artistica e tecnico-scientifica per la tutela e la valorizzazione del patrimonio culturale, *La Chimica e l'industria*, 2(5), pp. 35-42.
- [5] Lorusso, S., Natali, A., (2015) Promozione e conservazione dei beni culturali, in *Pensieri nascosti nelle cose. Arte, Cultura e Tecnica*, edited by Lombradi G. and Mantovani M., LAS (Libreria Ateneo Salesiano) — Angelicum University Press, Roma, pp. 352-373.
- [6] Lorusso, S., Cogo, G.M., Natali, A., (2016). The Protection and Valorization of Cultural and Environmental of the Heritage in the Development Process of the Territory, *Conservation Science in Cultural Heritage*, Vol.16, Mimesis Edizioni, Milano-Udine, Italy, pp. 59-73.
- [7] Lorusso, S., Natali, A., (2017). Drawing Value from Culture and the Territory, Athens: ATINER'S Conference Paper Series, No: CUL2016-2185. Printed in Athens, Greece by the Athens Institute for Education and Research. ISSN: 2241-2891.
- [8] Argan, G. C. (1968). *Storia dell'arte italiana*. Vol.3. Da Michelangiolo al futurismo, Sansoni per la Scuola, Firenze.
- [9] Lorusso, S., Matteucci, C., Natali, A., Apicella, S., (2013). Traditional and non-traditional, innovative and ephemeral materials and techniques in today's cultural heritage, *Russian Chemical Bulletin, International N Edition*, Vol. 62, No. 7, pp. 1671-1681, Juli 2013 ISSN: 1066-5285 (Print) 1573-9171 (Online)
- [10] Lorusso S., Natali, A., Matteucci, C., Palla, F. (2022). *Risk Management in the Cultural Heritage Sector: Museums, Libraries, Archives*, L'Erma di Bretschneider, Roma, pp 1-286, ISBN: 978-889-1325228.

- [11] Boncinelli E., 2015, *Noi siamo cultura: Perché sapere ci rende liberi*, RCS Libri Spa, Milano.
- [12] Lorusso, S., Matteucci, C., Natali A. (2013). *I beni culturali e ambientali: formazione e ricerca, interdisciplinarietà e internazionalizzazione*. Milano Mimesis Editore. P.1-182, ISBN:978-88-5750-803-0
- [13] Lorusso S., Mantovani M., Cogo G.M. (2018) Thinking independently and then, as one: the relationship between truth, art and science in the field of cross-disciplinarity, *Conservation Science in Cultural Heritage*, [S.I.], v. 18, Milano Mimesis Editore, p. 257-272, dec. 2018. ISSN 1973-9494.
- [14] Lorusso, S., Natali, A. (2014). Le diverse tipologie di riproduzione nell'arte, In: *Il diritto dell'arte. La "protezione del patrimonio artistico"*, edited by Negri-Clementi G., Stabile S., Skira, Ginevra-Milano, pp.155- 167, ISBN 978-88-572-2627-9.
- [15] Lorusso, S., Natali, A. (2015). Mona Lisa: A Comparative Evaluation of the Different Versions and Their Copies, *Conservation Science in Cultural Heritage*. vol. 15, pp. 57-109 ISBN: 978-88-5753-547-0. Mimesis Edizioni, Milano-Udine.
- [16] Lorusso, S., Matteucci, C., Natali, A., Apicella, S., Fiorillo F.L. (2013) Diagnostic-analytical study of the painting "Gioconda with columns", *Conservation Science in Cultural Heritage*. vol. 13, pp. 75-127 ISSN= 1974-4951. Mimesis Edizioni, Milano-Udine.
- [17] Lorusso S., Matteucci, C., Natali, A. (2022). I mercati dell'arte e le case d'asta: valutazione diagnostico-analitica e economico-finanziaria. In: *L'autentico, il falso, il riprodotto nel settore dei beni culturali*. L'Erma di Bretschneider, Roma, pp 1-286, ISBN: 978-889-1325204.
- [18] Lorusso S., Barone, V., Colizzi, L., Fonseca, C. D. (2014). Analytical-diagnostic and computing technology for the attribution, authentication and economic evaluation of art works, *Conservation Science in Cultural Heritage*. vol. 14. Mimesis Edizioni, Milano-Udine.
- [19] Lorusso, S. (2014) Critical Heritage in Cross-Cultural Perspectives. Interdisciplinarity, Internationalization and social media, in *Cultural Heritage: Some Case Studies*, *Conservation Science in Cultural Heritage*, vol. 14. Mimesis Edizioni, Milano-Udine.
- [20] Lorusso, S., Matteucci C., Natali A. (2011). The Shroud of Turin between history and science: an ongoing debate, *Conservation Science in Cultural Heritage*, vol. 11. Mimesis Edizioni, Milano-Udine.
- [21] Lorusso, S., Braidà, A. (2012). Art and environment as media for ecosystem sustainability, ethics and Aesthetics, *Conservation Sciences in Cultural Heritage*, vol. 12. Mimesis Edizioni, Milano-Udine.
- [22] Mantovani, M. (2014). Church and art: from the second Vatican Council to today, *Conservation Science in Cultural Heritage*, vol.14. Mimesis Edizioni, Milano-Udine.
- [23] Lorusso, S., Mantovani, M. (2019). Editorial. The integration of the knowledge "of mind, heart and hands" in the sciences and in life: singularity and normality, In: *Conservation Science in Cultural Heritage*, vol. 19. Mimesis Edizioni, Milano-Udine.
- [24] Lorusso, S., Mantovani, M. (2020). Editorial. Imperfection and perfection in culture, science, art, research, In: *Conservation Science in Cultural Heritage*, vol. 20. L'Erma di Bretschneider, Rome-Bristol.

- [25] Lorusso, S., Colizzi, L. (2020). Interdisciplinarity, ethics and territorial planning, In: *Conservation Science in Cultural Heritage*, vol. 20. L'Erma di Bretschneider, Rome-Bristol.
- [26] Mantovani, M. (2021). "on the twenty year anniversary of the Journal's publication" A philosophical look at the relationship between art and science, In: *Conservation Science in Cultural Heritage*, vol. 21. L'Erma di Bretschneider, Rome-Bristol.
- [27] Lorusso, S., Mantovani, M. (2021). Editorial. Syncretism and transdisciplinarity in art and life, In: *Conservation Science in Cultural Heritage*, vol. 21. L'Erma di Bretschneider, Rome-Bristol.
- [28] Lorusso, S., Natali, A. (2021). A second Mona Lisa? Challenges of attribution and authentication and various possibilities for evaluating a work of art. L'Erma di Bretschneider, Rome-Bristol.
- [29] Lorusso, S., Mantovani, M. (2022). Editorial. The Journal "Conservation Science in Cultural Heritage" In the coming years: a commitment to the "culture system", In: *Conservation Science in Cultural Heritage*, vol. 22. L'Erma di Bretschneider, Rome-Bristol.
- [30] Lorusso, S. (2022). Is the Louvre Mona Lisa Leonardo's second version? Methodological path, historical-bibliographic sources, final judgement. L'Erma di Bretschneider, Rome-Bristol.
- [31] Lorusso, S., Mantovani, M. (2023). Editorial. Synergy, technology and identity in art, facing the challenge of artificial intelligence, In: *Conservation Science in Cultural Heritage*, vol. 23. Gangemi Editore International, Rome.
- [32] Lorusso, S., Colizzi, L., Adamo, T. (2023) Artificial intelligence and digital reproduction in art, In: *Conservation Science in Cultural Heritage*, vol. 23. Gangemi Editore International, Rome.
- [33] Gugliermetti, L., Cinquepalmi, F., Marino, S. (2023) A tool to access unreachable sites inside the archaeological park of Ostia antica in Rome, In: *Conservation Science in Cultural Heritage*, vol. 23. Gangemi Editore International, Rome.
- [34] Soares da Costa Filho, A. (2023) Between Michelangelo and the holy shroud: artificial intelligence and its miracles, In: *Conservation Science in Cultural Heritage*, vol. 23. Gangemi Editore International, Rome.

### Biographical notes

**Salvatore Lorusso** formerly a full Professor at the University of Bologna, is currently a Foreign Member of the Russian Academy of Natural Sciences, Visiting Professor of the Faculty of Arts, Lomonosov Moscow State University, Russia and Emeritus Professor of the Cultural Heritage Institute of Zhejiang University (China) and Direttore Generale of the Accademia della Cultura Enogastronomica; formerly a Visiting Professor at the Academy of Social Science of Zhejiang University, China; formerly vice-president and Councillor of the Società Italiana per il Progresso delle Scienze (SIPS, established in 1839). His biography appears in the 2016 Marquis Edition of Who's Who in the World. He is the author of over 420 publications in national and in-

ternational journals and 25 volumes and monographs covering commodity science, cultural heritage and environmental issues. In 1997, he founded the Diagnostic Laboratory for Cultural Heritage at the Ravenna Campus of the University of Bologna and remained head of the Laboratory for eighteen years. In 2001 he founded the historical-technical Journal "Conservation Science in Cultural Heritage" of which he is Editor-in-Chief. His scientific work deals mainly with the study of the "system: artifact-environment-biota" and diagnostic, analytical, technical and economic evaluation within the context of the protection and valorization of cultural and environmental heritage.

**Luca Gugliermetti** (PhD) is a researcher at the Department of Architecture and Design (DIAP) of the University of Studies of Rome "La Sapienza" (Italy). With a background in energy engineering, after his doctorate in 2018, he spent two years as a research fellow at the Department of Astronautical, Electrical and Energy Engineering of "La Sapienza" University of Rome, and another two years at the Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA). Currently he is working on the Italian National Recovery and Resilience Plan for the digitalization of built environment by Digital Twin techniques. His research activities include thermo-fluid dynamics, sustainability, energy and digital systems, sensors, virtual technologies, space data and satellite systems.

## Summary

Within the context of art, science and the holistic value of artwork are two different ways of reading reality in the field of the protection and enhancement of cultural and environmental heritage. Reading reality is synonymous with the work of historians, which involves knowing, interpreting and evaluating works of art through a subjective evaluation and, of technicians, through an objective evaluation. By combining their respective competences and, consequently, forming an interdisciplinary relationship through a need that must reflect humility and a mutual need of each other (a necessary prerogative), they will, together, arrive at a scientific truth. These aspects are equally important in the formation and training of professional figures relating to the study and research of the system: artifact of historical-artistic interest-conservation environment-biota. The above is closely linked to the subject of attribution and authentication of artwork and to the different intermediate categories that authentic and reproduced works can be classified under. In the latter, which are the results of digital technologies, starting from authentic works, it is evident that ethical and aesthetic issues arise in relation to differences between authentic and reproduced works. In conclusion, as an emblematic historical-technical example of the relationship between art and science, mention is made of the Journal "Conservation Science in Cultural Heritage".