



ECOLOGICAL

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FE-SEM with integrated Raman
at the DINAMICO Laboratory
Photo Angelo de Simone Troncone
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PAPER CONSERVATION FOR A CHANGING CLIMATE

A low-tech solution in paper preservation, inspired by tradition and refined through innovation, with the support of GREENART.

In the meticulous world of art conservation, breakthroughs are rare and typically reserved for laboratories filled with cutting-edge machinery. Yet Salvador Muñoz Viñas, a seasoned paper conservator and professor at the Institute of Heritage Restoration from the Polytechnic University of Valencia, has developed a simple technique that may transform how works on paper are preserved. Drawing on old Japanese methods, modern materials and an intuitive understanding of the medium, his approach offers a sustainable and globally accessible solution to keep paper stable in fluctuating humidity.

What inspired you to develop this technique?

It began back in 2008. I was working at the university at the time. One of the blessings from working there is the freedom to choose complex projects, so I found myself experimenting with a method that combined traditional techniques with modern materials. It evolved gradually, through careful testing and refinement, but I held off on publishing anything. First, I wanted to see how it performed outside the lab, in the real world, because there is always the potential for unexpected variables. After some time, I realised that the technique was actually working better than anticipated, so I started developing it further and refining the process.

What are the main problems this technique addresses?

When paper is exposed, especially in large formats, changes in relative humidity can cause it to expand or contract, resulting in wrinkles, waves or distortions on the artwork. This physical change, called “cockling”, can compromise the aesthetic and structural stability of the paper. Museums try

to combat this by installing expensive air conditioning systems to keep humidity within a very narrow range. However, those systems are costly and not always the most effective. My technique helps maintain the paper smooth and visually appealing across a broader range of humidity levels, reducing or eliminating those distortions.

And how does the technique work?

The concept is relatively simple. It involves mounting the paper onto a piece of linen that has been tightly stretched over a wooden frame, just like a painter’s canvas. We often use linen because it offers the best results in terms of performance and durability, although other cellulose-based fabrics can also be employed with success. The paper is adhered to the fabric using a combination of strong and weak adhesive joints. The outer perimeter of the artwork is firmly bonded to the linen. At the same time, the rest of the surface — the central area, which in practice includes nearly the entire surface except the borders — is attached with a weaker, reversible adhesive. The exact extent of this soft joint varies

according to the characteristics of the specific artwork. This setup enables the paper to expand and contract naturally in response to changes in humidity, without warping or buckling. The method draws on East Asian conservation traditions. Still, we have reimagined it with a creative twist and the use of modern materials, particularly a synthetic adhesive that retains its grip at room temperature, offering both stability and reversibility.

What were some of the real-world tests or applications of this method?

There have been three major unexpected tests. The first one involved 19th-century maps stored in a penthouse that flooded during a heavy storm. Surprisingly, they remained in excellent condition. The second test involved early 20th-century cinema posters that had been stored for five years in poor conditions, more particularly in a furniture warehouse without climate control. When I went to inspect them, I was surprised to find they were still in excellent condition. The third and most dramatic test came during the 2024 Dana floods in Valencia. The very same posters were stored in a building that flooded with up to 80 centimetres of water and they remained submerged in that environment for ten days. Three weeks later, when we were finally able to examine them, the lower sections, which had been submerged, were damaged and covered in mud. However, the upper portions, which had been exposed to extremely high humidity, were completely intact and perfectly flat. In all three cases, the technique not only worked, but it exceeded expectations of real-world, high-risk scenarios.

How did your involvement with GREENART begin?

When GREENART was announced, I applied on behalf of my university, proposing a system that could significantly reduce the need for strict climate control in exhibition spaces. The project provided

us with the resources to study the technique rigorously — running tests, developing mock-ups and confirming that it worked across various settings. It has validated the technique to such an extent that we can now disseminate it through workshops and publications. GREENART has funded most of the research work, including staff time, materials and logistical support. All this help has allowed us to refine and document the technique. We are now starting the dissemination, as with the lecture in Paris where we presented the method for the first time and an upcoming hands-on workshop in Athens. The support we received in Paris was particularly meaningful, not least because the Centre Pompidou expressed interest in the technique. Beyond presenting the technique to the world, it is essential to ensure a genuine understanding and practical competence. GREENART has been instrumental in supporting this educational mission, helping us to emphasise teaching through small-group workshops where practitioners can engage with the method. Hands-on experience is essential; the technique must be “felt”, tested and practised.

What advantages does your technique have over more traditional methods?

It increases the relative humidity range within which paper remains flat by 10 to 20%. That is quite significant. Paper treated this way recovers its shape more quickly after humidity fluctuations. Traditional methods often leave the paper somewhat deformed after exposure to high moisture, but ours allows it to bounce back to its original shape. Additionally, it is far more affordable and environmentally friendly than building sealed microclimate display cases. It is also a low-cost, low-tech, high-efficiency technique. Unlike traditional solutions that rely on climate-controlled vitrines or air conditioning systems, both of which require ongoing maintenance and

significant energy consumption, this approach avoids high expenses. Beyond that, moving a large framed paper piece mounted in a vitrine can involve specialised equipment and logistics. But works treated with this technique remain light, manageable and easy to transport. Lastly, the method uses basic and natural materials: linen, wood and starch, paired with a small amount of synthetic adhesive. Its elegance lies in its simplicity: no machinery, no sensors, no need for advanced infrastructure. This makes it especially well-suited to institutions with limited resources and regions where consistent climate control is neither feasible nor sustainable.

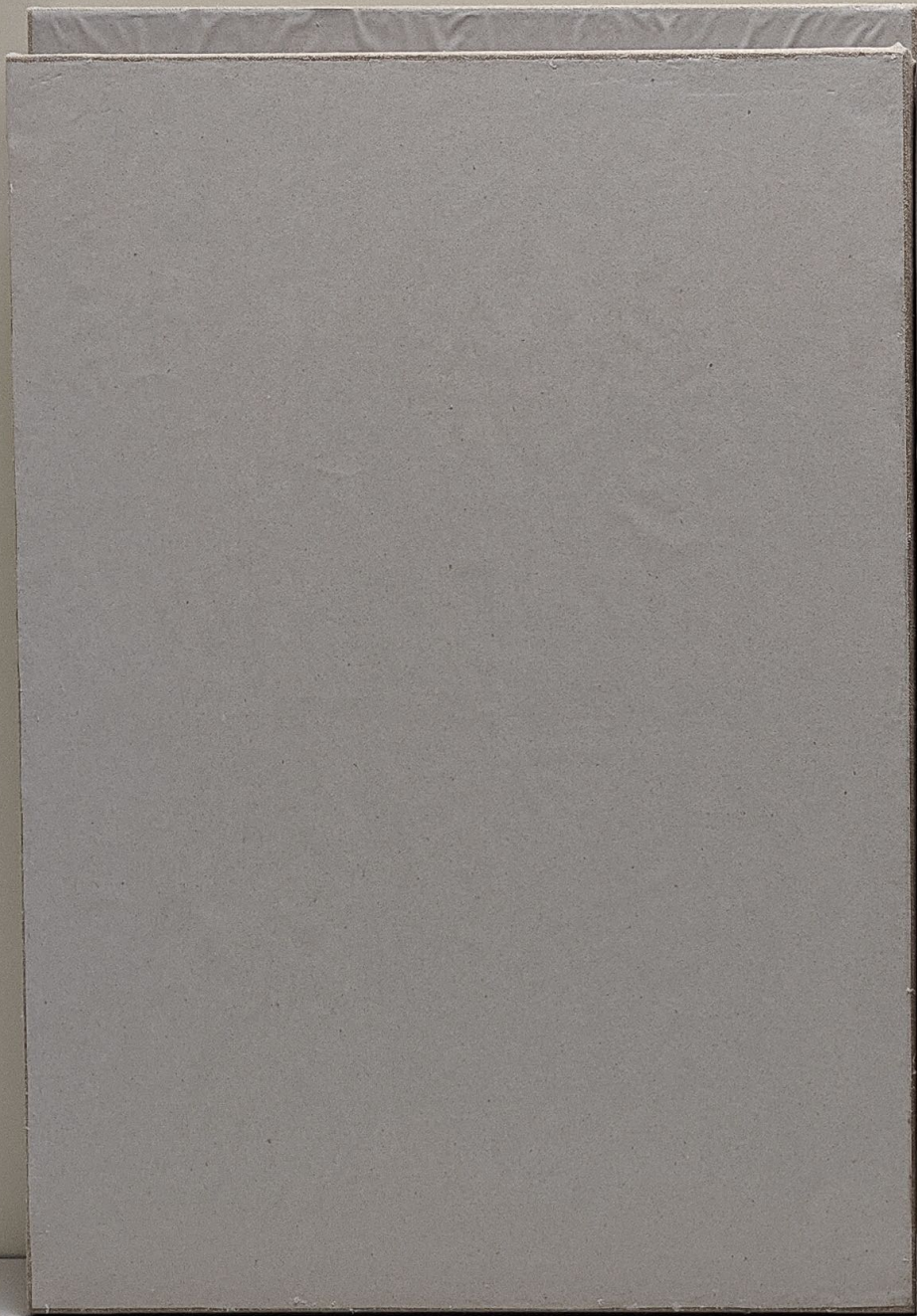
How does it affect the artistic integrity of the piece?

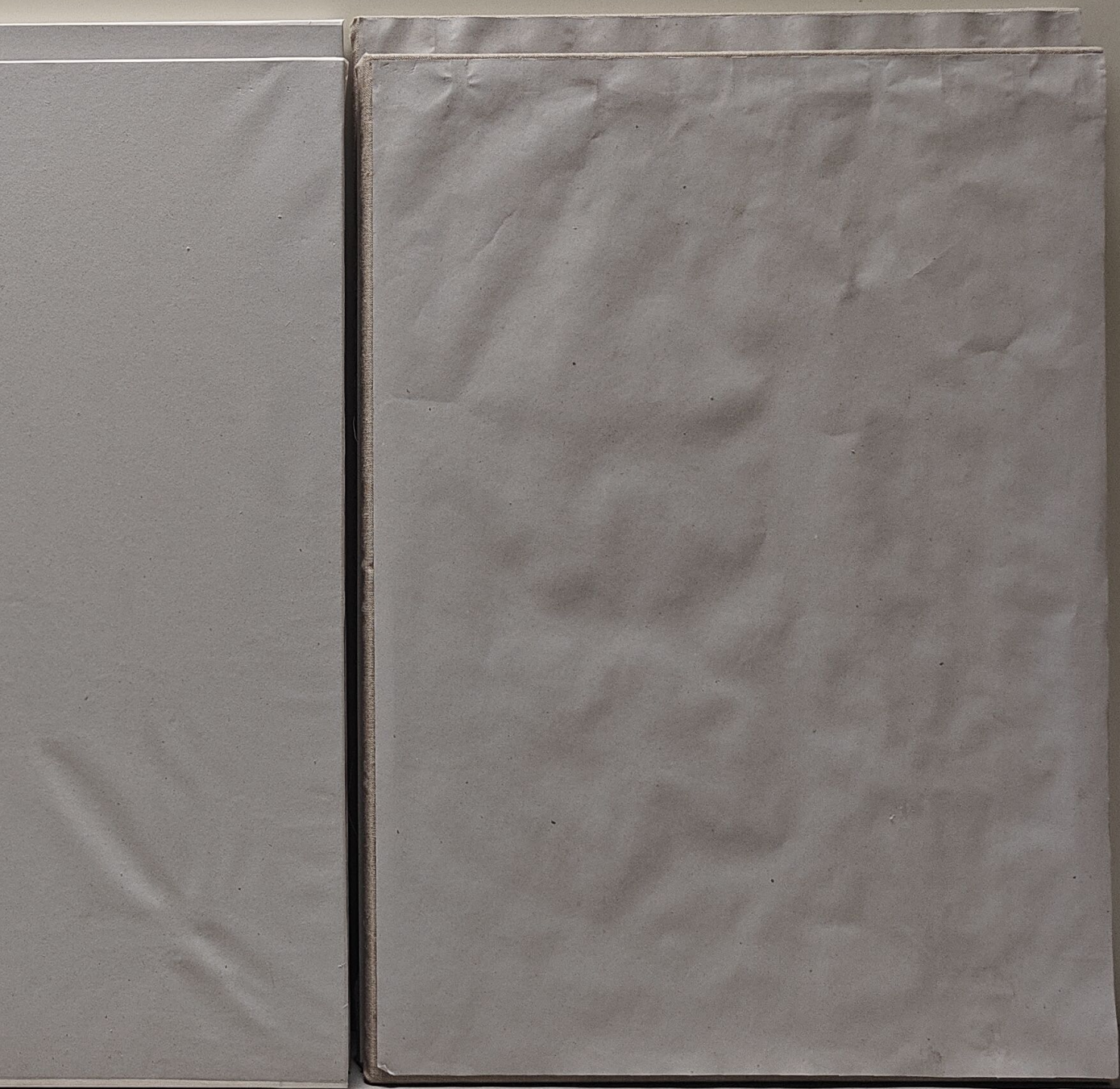
Artistically, the paper looks smoother and flatter. That might be a concern if the artist intended a more textured surface; however, the technique does not need to be applied in this case. We are also altering the original nature of paper by supplementing it with other materials. But from a conservation standpoint, most systems alter the original nature of the paper in some way. Conservation is not about freezing an artwork in time but about ensuring it remains accessible and meaningful for future generations. In that sense, change is not a failure of conservation; it is in its nature when done with care and intention. The technique alters the piece in a minimal and respectful way and this is fully reversible. The adhesive used in the central area is designed to leave no visible trace, even under magnification. It is like a Post-it note — strong enough to hold, yet easily removed without damaging the underlying material. And if, in 100 years, conservators develop a more efficient technique, then this method allows them to start again. That is the ethical cornerstone of modern conservation: do what works best today, but leaving the door open for the future.



Salvador Muñoz Viñas

Courtesy Salvador Muñoz Viñas. Polytechnic University of Valencia





Testing the technique on mock ups
Courtesy Polytechnic University of Valencia

You previously mentioned Japanese inspiration...

Japanese paper conservation is incredibly sophisticated. They use handmade paper with unique fibre structures that can be manipulated while wet, which Western papers cannot handle. They mount and dry papers on special lattices called *karibari*. My approach replaces the costly and complex system with a tensioned linen canvas, achieving a similar effect using a more straightforward and more accessible setup. The key is the interaction between the paper and the canvas — their differing reactions to humidity help balance each other out.

Could this method be scaled up?

Technically, yes. But it is not a product you can just buy — it is a technique that requires training and experience. Once someone learns it, they can adapt it to local materials and needs. Intuition and tactile understanding come with practice. That is why workshops are vital. It is not for *virtuosos*; it is designed to be simple and accessible, even in countries with limited resources. In fact, I hope to take it to Asia or Latin America in the near future. Many regions in these areas face challenging climates, characterised by dramatic and frequent fluctuations in humidity levels. This method could provide an affordable and effective solution for institutions that may not have access to high-tech conservation infrastructure or those seeking to reduce spending on room climate control.

Is anyone currently using it in an institutional setting?

So far, just the institutions I have worked with: the University of Valencia-Estudi General, the Polytechnic University of Valencia and the Valencian Institute of Cinematography. Plus, I have also used it on works from several private collections. As we offer more training and publish our findings, I expect the technique to spread. It is an easy and eco-friendly solution that could benefit museums, collectors and conservators worldwide.



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