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## A first for Europeana: daguerreotypes in 3D

### Authors:

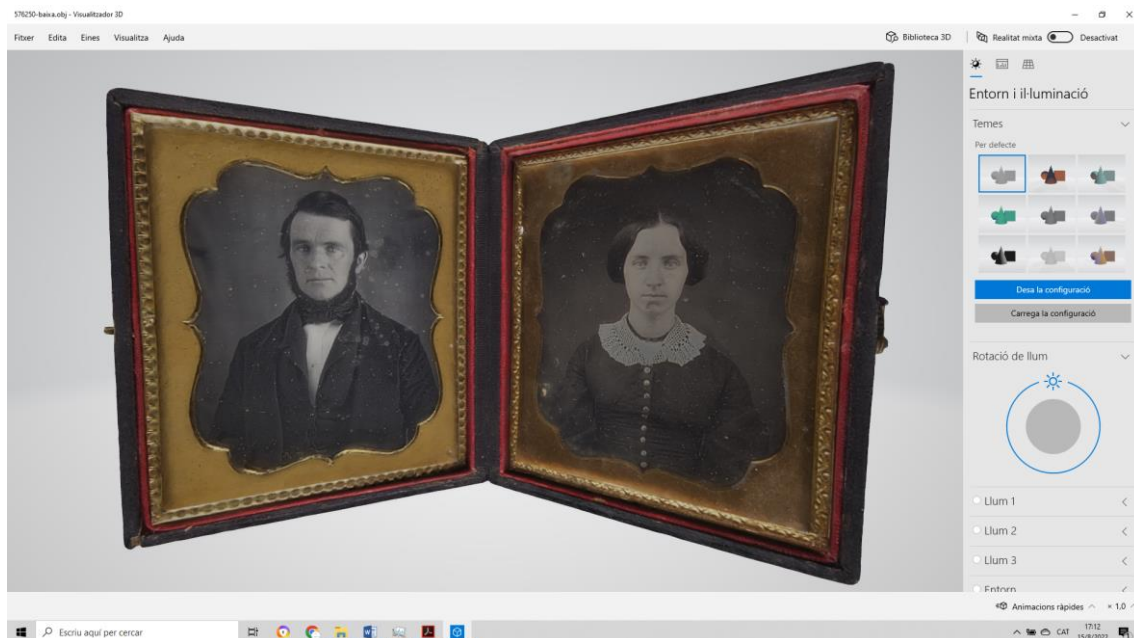
- Marc Hernández - La Tempesta
- David Iglésias - CRDI (Ajuntament de Girona)
- Sofie Taes - KU Leuven, Photoconsortium

The Centre for Image Research & Diffusion (CRDI), Girona owns a large and diverse photography archive that reflects daily life in the region of Girona, Catalonia over the past two centuries. In 2022, CRDI digitised [99 items](#) from its collection of daguerreotypes, the first form of photography created in France 1839, in 3D and aggregated them to Europeana: an important achievement not only for the project, but for professionals in the field of photography at large. This blog and activity were realized in the context of project WEAVE, co-financed by the European Union under the Connecting Europe Facility (CEF) Programme.



## The daguerreotypes of CRDI

CRDI's daguerreotype collection comprises two main subsets. The Ángel Fuentes de Cía collection is named after a photography curator from Navarra who became a leading figure in the world of daguerreotypy, and consists of 131 images among which 73 daguerreotypes, three cases with two daguerreotype images, 8 ambrotypes, 1 case with 3 ambrotypes and 1 daguerreotype, 1 stereotype ambrotype, 1 viewfinder, 1 frame with 4 daguerreotypes and 8 ambrotypes, and 10 daguerreotype jewels. The Joan Basseda Casas collection, spurring from a jeweller and collector from Vallvidrera, consists of 87 images: 24 daguerreotypes, 11 ambrotypes and 52 ferrotypes, some of which are part of an album of gems.



*Double portrait: a couple united in one daguerreotype case*

With 117 daguerreotypes, the collection is substantial and of international importance. But it's the quality, too, that makes it highly relevant: the collection - of which all pieces date back to the 1840s and 1850s - allows us to refine the early history photography, both from a technological and cultural point of view. The variety of the objects is stunning, since - in addition to the encapsulations characteristic of the period (wooden cases and other thermoplastics) - we find images in continental frames, stereoscopic images and daguerreotypes processed in jewellery artefacts. Case covers are made of leather, inner cushions (intended to expel the air when the case is closed) of silk or velvet. While most images are studio portraits, a wide range

of sitters is represented: from individuals and couples to families and groups. The collection also contains two postmortem portraits and two sculpture reproductions in stereoscopic format. Sizes vary from quarter plate (83x108 mm) and sixth plate (70x83 mm) to ninth plate (51x64 mm), some sixteenth plate (34x41 mm) and even some half plate (114x140 mm) and two stereoscopic plates (80x170 mm).

## Daguerreotypes in 3D: challenges

The digitization of the collection was entrusted to the company [La Tempesta: City, culture & technology](#), specialised in digital cultural heritage. A producer, a photographer and two 3D photogrammetry technicians participated in the preparatory processes, photographic capture and post-processing, under overall coordination by CRDI.

Together, the team had to weather daunting challenges. In fact, taking conventional (two-dimensional) photographs of daguerreotypes is already laborious, as the objects behave like mirrors: their image is formed on a polished metal surface. Furthermore, a daguerreotype is simultaneously negative and positive, depending on the angle of observation and incidence of the light it receives and what it reflects. If daguerreotypes are reflected on a black or dark surface, it is possible to observe their positive. To arrive at building a 3D model, captures from various angles and positions, in successive turns of the object are required to minimise the potential appearance of reflections and glare.



*Dealing with the moving parts: hooks and loops challenge photogrammetry practices*

Another difficulty was the variety of “morphologies” in which the images were housed. The CRDI daguerreotypes have different sizes and thicknesses, are housed in cases or hinged cases and often have moving parts (such as hooks and chains). While any digitization technique requires the object to be handled as little as possible during the process, in this case interference was necessary: the objects needed to be photographed from the front as well as from the back side, so diligent efforts had to be made to try and keep moving parts in the same position when flipping over the object.

## **Getting to work: diligent preparation and a dark booth**

The application of the photogrammetric technique for the large number of objects at hand required a search for solutions that were both effective (optimal results) and efficient (resources used). To this end, four days of research and testing were necessary to achieve results apt to get extrapolated to the large-scale digitization of the entire collection of daguerreotypes.

A crucial part of the preparatory process was the setup of a suitable working space. To this end, an area of approximately 12 cubic metres was covered with black cloth, so that everything reflected by the daguerreotype would be as black as possible and - avoiding the negative image view - a positive image could be obtained. In the centre of the set a 90 cm turntable with a black surface was positioned.



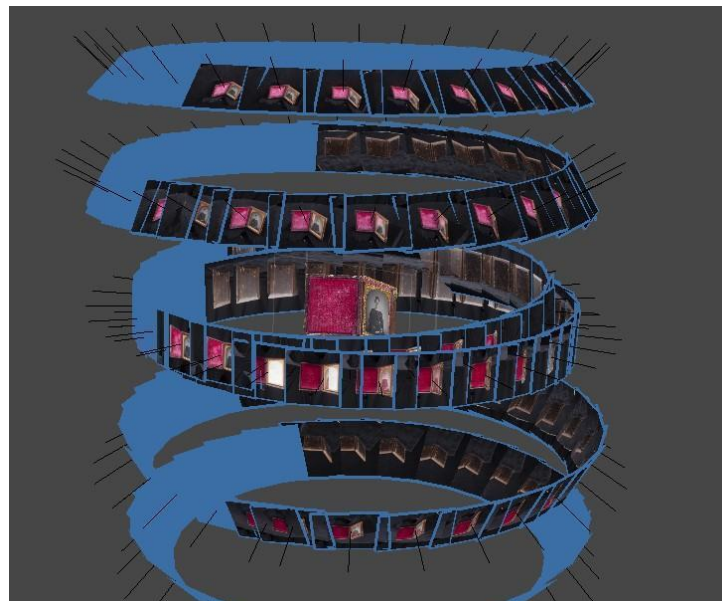
*The digitisation booth at CRDI, Girona*

The daguerreotypes were placed at the centre of the turntable on plastic and expanded polystyrene (EPS) supports , specifically designed so that they'd remain fixed when rotated.



*Triple camera setup in the digitisation booth*

The turntable was then calibrated to move 15° in between shots, so that a total of 24 photographs were taken per turn. Having three cameras shooting simultaneously at different heights and inclinations, allowed for executing the process in one complete turn with the daguerreotype on the right side (24 x 3 cameras = 72 photographs) and one on the other side (24 x 3 cameras = 72 photographs) resulting in a series of 144 photographs per daguerreotype.



*Collating captures to form a 3D view*

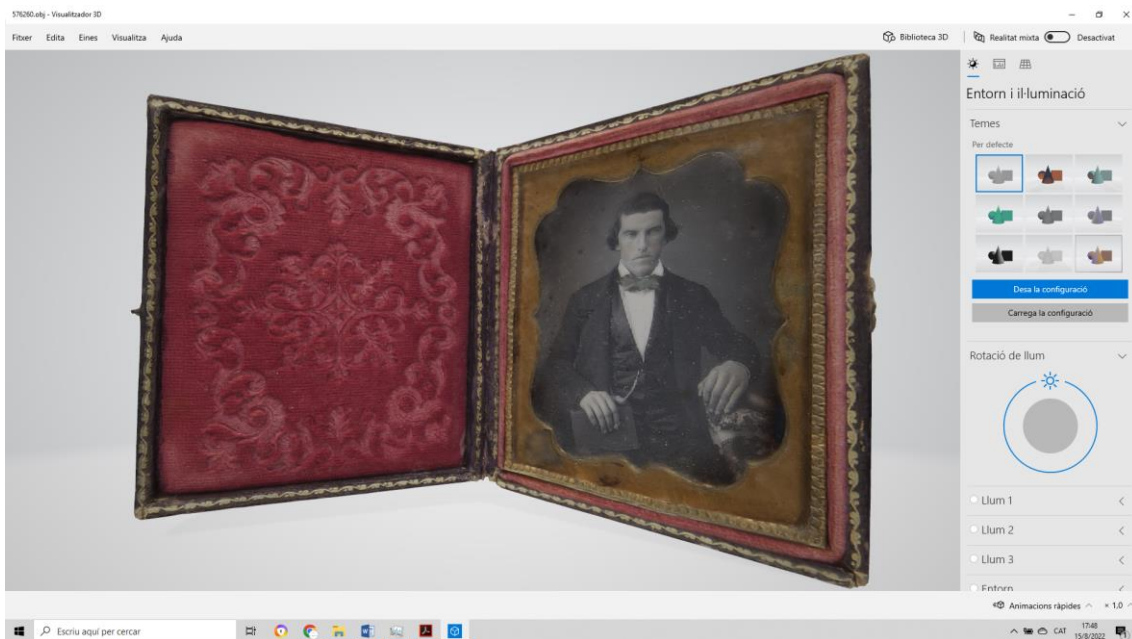
The set was illuminated by two spotlights with a diffuser screen at approximately 50°, achieving a scene with homogeneous light, without shadows. Each spotlight was decked with four bulbs of 4000 lumens and one of 1800, totalling 35600 lumens. We opted for a cold light tone of 6000 degrees kelvin.

The objects were shot at a hyperfocal distance: at each camera movement for each new turn, we focused on the face of the person/s portrayed and counted on the high depth of field to obtain focus on all the pieces when making the turns. However, for the corners and closures of the sleeves (the areas we observed as problematic in the assembly of the 3D object), specific photographs were taken (with the same focal length) to provide sufficient information to the post-production program.

## Photogrammetry results and post-processing

Despite the diligent setup and preparatory research, we found the results not always free of reflection and varying depending on the morphology of the object. However, investing time in finding the optimal mix of parameters and settings, and moving on to the next phase of 3D post-production with a good number of captures allowed us to obtain models of more than satisfactory quality.

We consciously opted for these models to remain faithful to the original daguerreotypes, allowing us to appreciate those aspects most interesting from a heritage point of view, such as incisions on frames or stains on silk lining. We therefore chose not to "idealise" the daguerreotypes with a virtual recreation resulting from modelling parts of the daguerreotypes in 3D or applying VFX.



*Post-processing the 3D models*

Instead, the models were processed with [Agisoft Metashape](#) software, which generates models on the basis of photographs from different points and angles. To this end, it is essential to have common elements between photographs, creating overlappings that facilitate the program's recognition of the surface. The program then generates a point cloud from the photographs, which will later form a mesh of triangular polygons.





To correct the distortion caused by light and specular reflections, masks had to be built so that the processing program could interpret them correctly. Once we built the masks automatically (eliminating background and base) and manually (eliminating brightness), we proceeded to unify all the photographs in a single workflow and generate the model. We then re-aligned the photographs and obtained a point cloud of the object, generated the mesh and built the textures.

The resulting 3D model contains a large number of polygons. Therefore, decimated models were derived, with polygons limited to 50.000. Less geometrically defined, these models proved much more manageable while maintaining the original contours and providing an optimal view once texture is applied. We found this decimated version to be the best option for broadcasting or uploading to 3D platforms.

As for aggregating the content to Europeana, we found the process quite straightforward and not that much different from providing 2D-collections. The results can be viewed in [Europeana](#), where each item is described in detail and linked to [WEAVE 3D assets manager](#) developed in the project.

## Takeaways

Using the photogrammetric technique on daguerreotypes has required specific research and a series of iterations through a pre-testing process. We applied photogrammetry putting to best use its advantages while trying to subvert its limitations. In the end, we are delighted with the results and what they represent in a broader perspective: the 3D digitization of the CRDI daguerreotypes has not only provided us with a unique opportunity to learn more about this photographic technique but also to give visibility to one of the most outstanding collections on the continent.