FUSION OF 3D INFORMATION FOR EFFICIENT MODELING OF CULTURAL HERITAGE SITES WITH OBJECTS

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To model a complex environment (one composed of several objects with various characteristics), it is essential to combine data from different sensors and information from different sources. We propose a general approach based on sensor fusion techniques that combine models created from multiple images, single images, range sensors, known shapes, CAD drawings, existing maps, survey data, and GPS data. This approach minimizes the impact of uncertainties characterizing each source of information.
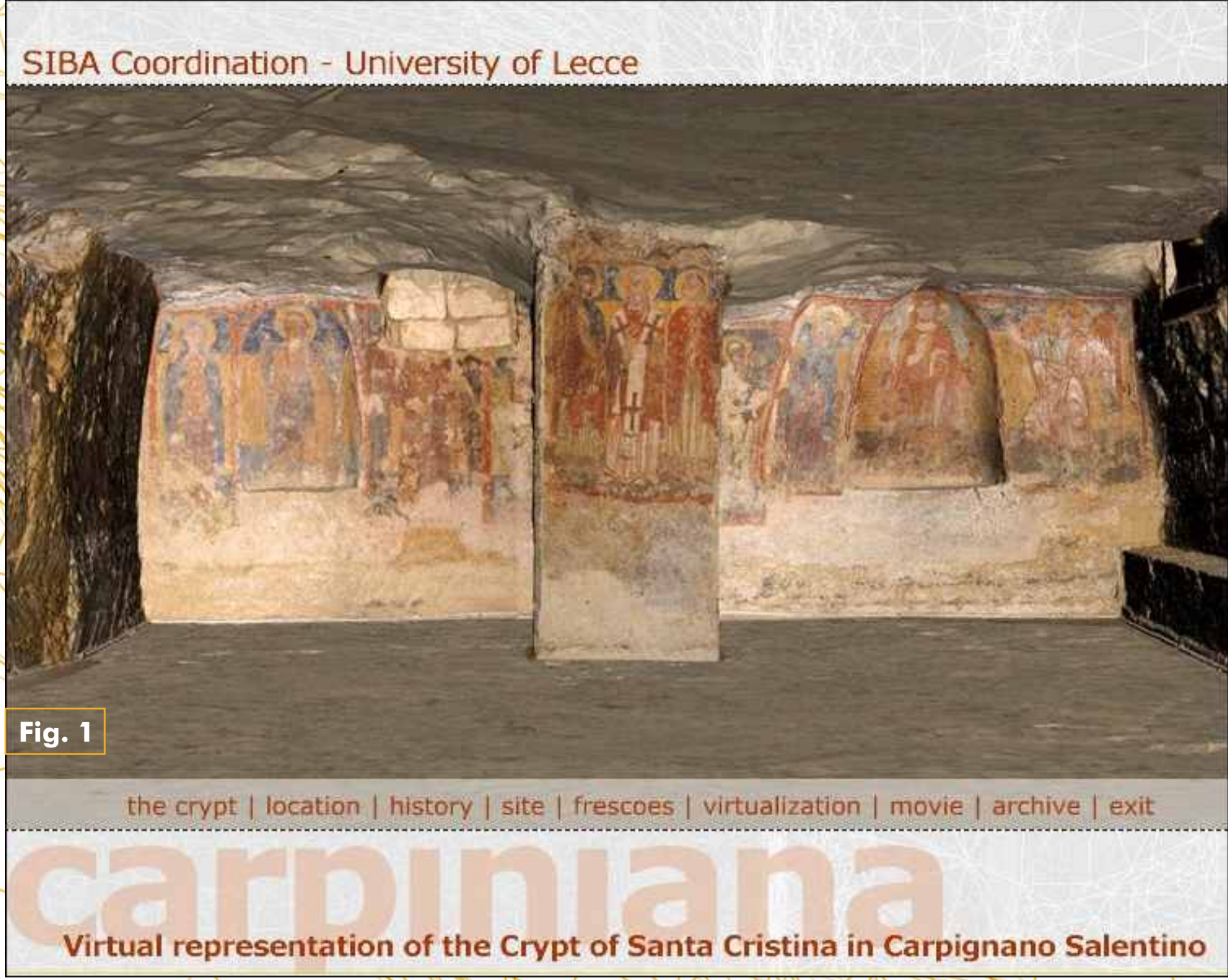
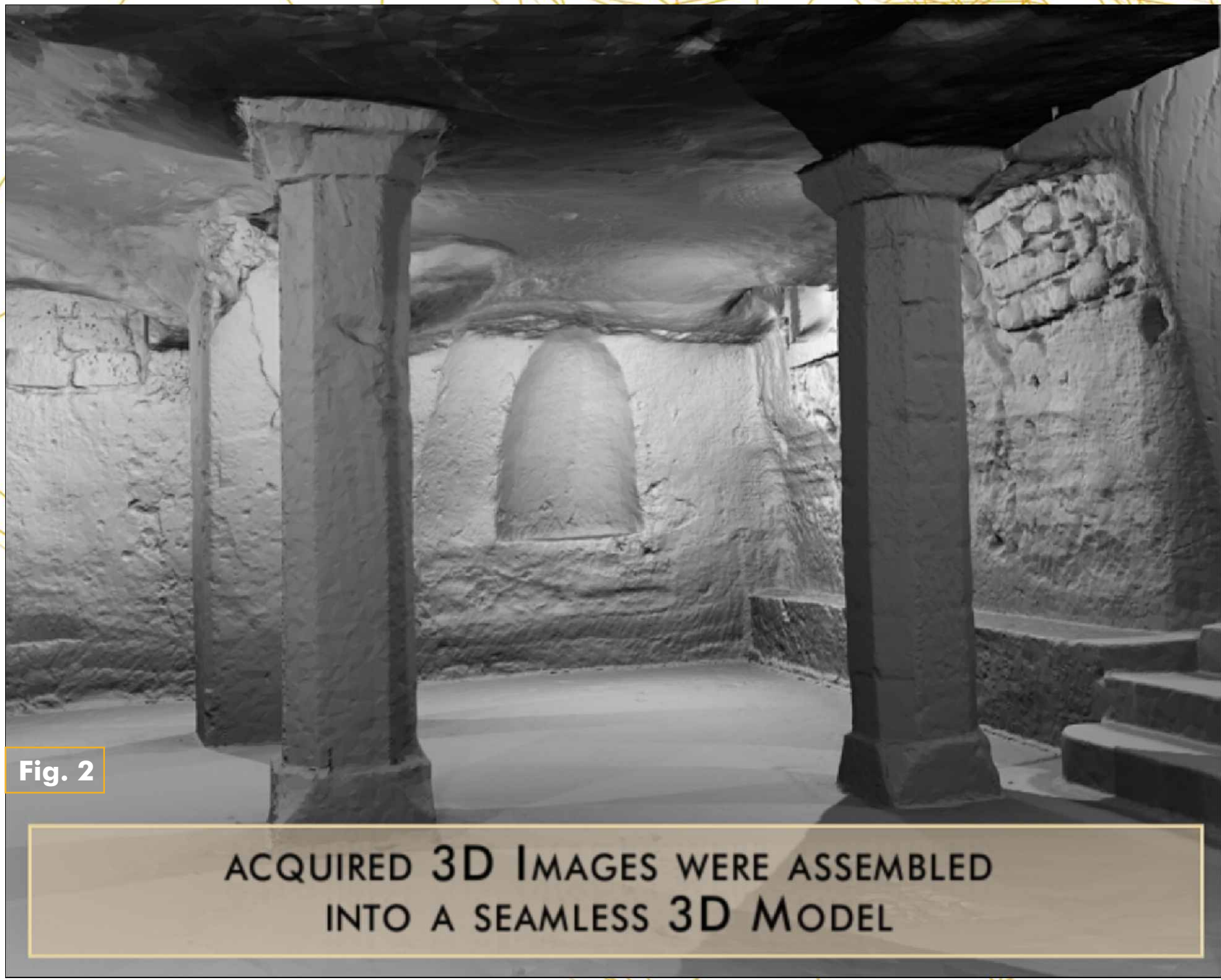**Figure 1.** Entrance page of the CDROM CARPINIANA.

Figure 2. Still image taken from the movie included on the DVD: view of crypt without texture. In the video animation, the colour information is introduced half way in the movie.
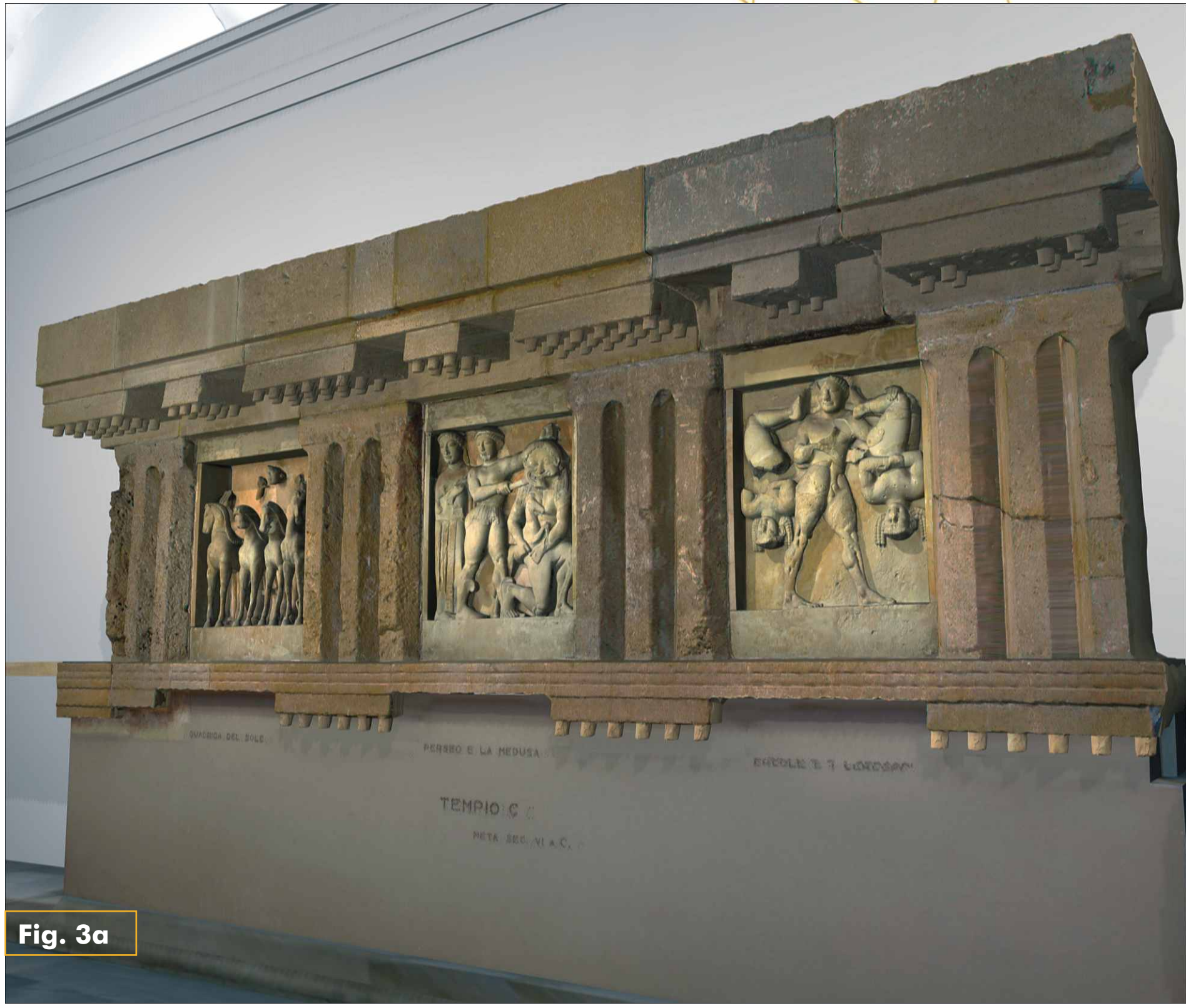

Figure 3. Three-dimensional model of a section of the frieze of Temple C of Selinunte, a) texture-mapped 3D model, b) wiremesh of 3D model showing the levels of details.

Sites description

The results of the two sites presented here are aimed at the general public and to a certain degree to the expert. The first site is the Byzantine Crypt known as the Crypt of Santa Cristina, which is located in Carpignano (LE), Italy. Already, results on a CDROM, a DVD, a virtual 3-D theatre, holograms and a video animation have been prepared for this project. Figure 1 shows the entrance page to the CRDOM while Fig. 2 shows a snap-shot of the video animation on the DVD. The second site is Temple C of Selinunte, Sicily. Information from two different laser scanners, photogrammetry and CAD were combined together. For the acquisition of detailed 3D information with texture, laser scanning and digital photographs using a calibrated camera/lens were used. At the moment the museum room (regional Museum of archaeology of Palermo, Italy) containing mainly metopes from Selinunte was modelled using a mixture of the above mentioned technologies. In this poster, results from this last site will be presented in more details.

The three Metopes of Temple C

The 3D model of the remains of the frieze from Temple C including three Metopes is shown on Figs. 3 a and b. The first laser scanner was used to acquire details in the order of 0.5 mm while the second scanner captured details in the range of 2-10 mm. A rendering of the complete museum room (21 m × 8.1 m × 7 m) (see Fig. 4a for a photograph) dedicated to Selinunte is shown on Fig. 4b. High quality textures were realized using flash lamps, a MacBeth chart and Photoshop. A video animation was realized using a model containing 5 million triangles, the maximum texture resolution available, 64 lights, and 6700 frames at a resolution of 720 × 576 (see Fig. 4b). In order to access hard to reach areas on the metopes, a mirror had to be used as shown on Fig. 5. A wire mesh on Fig. 6 shows the multi-resolution model that was created.

Conclusion

Models of large objects, structures and environments are possible but require the combination of a number of techniques. More research work is required to speed up the process of acquisition and modelling. The problem we addressed in this paper is the use of 3D modelling to enhance the understanding of a cultural heritage site that needs to be preserved and shown to more people in order to raise awareness and understanding.

Figure 4. Virtualized Museum room, a)photograph of the room dedicated to Selinunte of Palermo, Sicily (Museo Archeologico Regionale), b) rendering of the complete 3D model of the same museum room.

Figure 5. Practical considerations when using a 3D scanner: mirror used to reach hidden 3D surfaces.

Figure 6. Multi-resolution 3D model of the Selinunte room.

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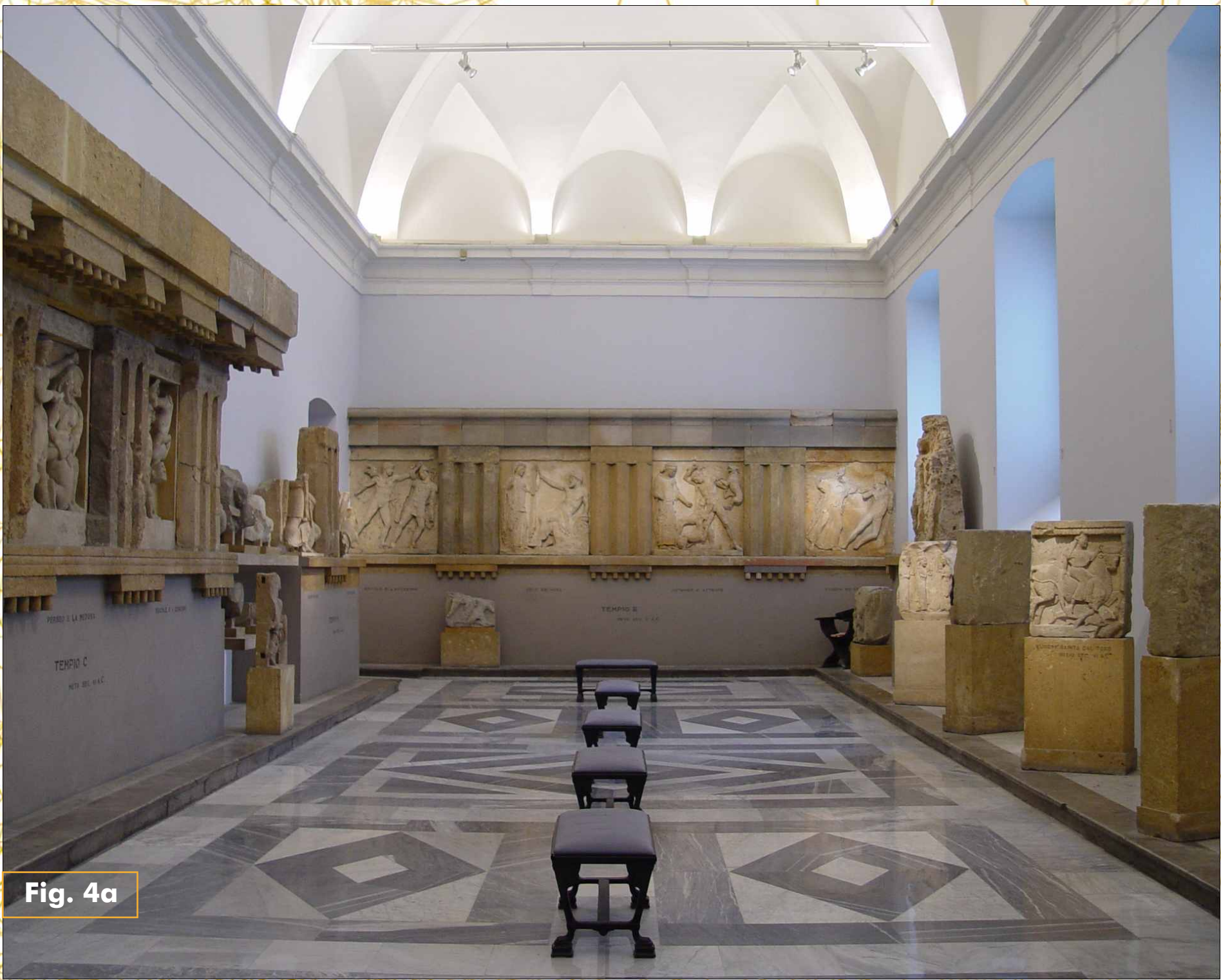
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