3D RECORDING AND ICONOGRAPHIC ANALYSIS IN A COMPARATIVE PERSPECTIVE

ADVANCES IN COMPUTER-SUPPORTED IMAGE ANALYSIS

Thursday, March 28 13:00 – 17:00
Merete Barker Auditorium (1253, 211)

Everybody welcome !

Programme:

13:15 **Jens Andresen (AU):** *Welcome*

13:20 **James Andrew Dodd (AU):** *The application of high performance computing in rock art documentation and research*

13:45 **Serge Cassen (CNRS - Université de Nantes):** *In search of the images in Neolithic engraved representations*

14:45 **Pause**

15:00 **Johan Ling (University of Gothenburg):** *A future carved in stone – an artificial intelligence approach to motive detection in rock art*

16:00 **Discussion**

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ABSTRACTS

James Andrew Dodd

The application of high performance computing (HPC) in rock art documentation and research

Image based modelling using the multiple view Structure from Motion implementation is one of the most widely applied, accessible and deployable solutions to 3D documentation. However, one of the main disadvantages is perceived as the heavy computational power required to acquire results that are both highly detailed and / or on a large scale as part of the documentation of whole surfaces. There is also the disadvantage that processing needs to be conducted away from the field, thereby throwing away the opportunity to derive full benefit from the results on site.

Using a wireless router connected to the mobile phone network, files and projects can be sent to an HPC from a laptop in the field, for remote processing in an interactive interface. Results can be inspected on the virtual machine and finished products exported back to site for study of the rock surface. Making the models available for use in the field allows them to be used as a powerful investigative tool. This enhancement arises from the possibilities to reconcile the findings of the model with the features of the original surface and vice versa.

In the future, this technology will be more widely applied as access to processing on fast hardware improves and becomes more democratized. Therefore, improvements to the workflow and possible avenues for future technological development will also be outlined.

Serge Cassen

In search of the images in Neolithic engraved representations

In order to describe the engravings that first antiquarians discovered on the rocks, steles, and walls of the Neolithic tombs of Western Europe, they searched for ways to represent the morphology of the slabs. They decided to use watercolors as an illustration and experimented with artificial light to investigate the stone reliefs. However, in their desire to clarify the layouts, they eliminated the natural detail and gradually lost the third dimension. Finally, by the second half of the 20th century, the documentation techniques resulted in the surface being represented as a plane object, thus leaving the signs effectively decontextualized.

The talk will reconquer the slab as a 3-dimensional object. Various techniques of acquisition have been mobilized (lasergrammetry, structured light, photogrammetry). Experience suggests that the engravings themselves are better detected by a compilation of images under oblique lighting – regardless whether the illumination is real or virtual. Once we have inventoried the outlines of the compositions, the relations of antero-posteriority can be identified in order to suggest a chronological sequence. In addition, the qualities of the imagery allow us to approach certain aspects of the *chaîne operatoire* adopted by the engraver, whilst the peckings were still visible on the stone. Following these steps in the analysis facilitates the discovery of gestures, forces, tools, sequences of manufacturing, and other signs which it is also advisable to consider as 3-dimensional objects. Lastly, working with different color spaces, using image decorrelation techniques, facilitates the distinction between several disorders, from mineral disintegration to biological colonization, which are all different kinds of alterations influencing the good reading of the Neolithic compositions.
In this regained scene, the engravings will sometimes continue from one side of the slab to another. Through this “off-screen” iconographic technique, the signs are able to demonstrate mobility, denoting the fourth dimension by indicating the time taken to carry out a movement, which might be defined as the journey inside the symbolic representation.

Johan Ling, Bettina Schulz Paulsson, and Christian Horn

A future carved in stone – an artificial intelligence approach to motive detection in rock art

From plaster casting and tracings to night photography and rubbings, petroglyph documentation has mostly relied on the three-dimensionality of rock art: the fact that it not only extends in a plane but, indeed, has depth. Despite a constant search for a method that preserves rock art in all its complexity, most documentation techniques discard depth information, despite depending on it. With the introduction of 3D documentation methods (photogrammetry and laser scanning), the rock art heritage can now for the first time be accounted for in all three dimensions without posing a risk to the panels. 3D documentation is not only a more complete record of the rock art heritage, but provide an enhanced research potential through more flexible viewing possibilities, several post-processing opportunities, and qualitatively consistent comparative data.
The above mentioned advantages have reinvigorated the use of typological comparisons of carved metalwork to objects found in datable contexts. They also enhance the detectability of superimpositions. Furthermore, new details on known carvings have been discovered, for example, in Kivik, Scania. Comparisons with metalwork, study of superimpositions, and observations of new details all help to refine the rock art chronology, allowing us to detect similarities and differences between widely separated regions.
The Swedish Rock Art Research Archive (http://www.shfa.se) is engaged in several projects and has started a new initiative to realize the potential of the 3D documentation. These include 1) the comparison of rock art on the Iberian Peninsula and Scandinavia 2) constructing an Artificial Intelligence approach to motif detection, and 3) developing new visualizations that provide the accuracy of 3D models and the clarity of the older 2D documentations.