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**EPOCH**

**Excellence in Processing Open  
Cultural Heritage**

Network of Excellence

Information Society Technologies

**D.2.7.1: Report on Brokerage Activity, Initiatives, Take Up and QC**

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Ename Center

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<b>Dissemination Level</b>		
<b>PU</b>	Public	
<b>PP</b>	Restricted to other programme participants (including the Commission Services)	
<b>RE</b>	Restricted to a group specified by the consortium (including the Commission Services)	
<b>CO</b>	Confidential, only for members of the consortium (including the Commission Services)	X

## **1. Introduction**

This report deals with the Brokerage Services in the first year of EPOCH.

Four types of services were provided :

- sharing of Scarce Resources
- set up of the partner database
- support for Endangered Sites
- provision of Data Repository

The first year was used to prepare the website services and contracts. Two projects concerning endangered sites were undertaken. The data repository and several datasets and software modules were prepared.

## **2. Brokerage Activities**

### **2.1. Scarce Resources**

The Brokerage Service originally was intended to be a service to provide resources, available in the Network, to projects and institutions that had a need for those resources. These resources could be physical infrastructure, such as equipment or specialist facilities, or specialist skills. A first overview of the resources, present at each EPOCH partner, was already collected at the proposal stage.

Two problems did make that this service was not really successful. First of all, there was very little demand for such service. The mailing to the EPOCH partners only resulted in the offering of some new resources (such as a motion capture system at the University of Warwick). This was probably due to the fact that the EPOCH contact person, who receives the email, is not always the right person to react to this kind of request, and the email did not always reach the more technical people. Secondly, it took some time for the website to become operational and deal with the brokerage aspect. The lack of this channel at the beginning of the project could also have had a negative impact on this activity. On the other hand, as there is little tradition that institutes use each other's equipment or facilities, this service should have been promoted much more aggressively. Also, the use by companies doing cultural heritage projects was not present yet, as a structured interface to the companies (see Activity 2.8) is still in development.

Several EPOCH related projects were submitted under the Marie-Curie and INTERREG 3 programmes. One Marie-Curie project (CHIRON) was approved, and at this moment, there is no decision yet on the others. The consortia consisted mainly of EPOCH partners, with some additional partners.

A webservice to do image-based rendering (see showcase 8) will be available from the Sagalassos Division in year 2.

### **2.2. Partner Database**

The basis of the brokerage service is the partner profile that was collected through an extensive form at the creation of the proposal. This information was checked for completeness, and updated where needed, to be transferred into the website database. This partner information was made available in the partner area on the website in the second semester, and each partner was invited to update this information to the most recent status. Partners looking for other partners with specific skills or research domains or equipment can find this information online.

### **2.3. Endangered Sites**

A special form of service was providing support for endangered sites, where funding was available to do an intervention at such a site, and take appropriate measures such as safeguarding, protection or recording.

Several actions were taken in this area. First of all, a brokerage agreement was made for interventions at endangered sites (see paragraph 3.1). This agreement specifies the intervention, the partners and why the site is considered to be endangered. When approved, the data of the intervention will be made available to the EPOCH community through a download agreement (see paragraph 2.4).

Secondly, the site of Akrotiri (which is an EPOCH partner) was visited in the course of other business. This archaeological site contains the remains of a Minoan city that was devastated and covered under volcanic ash in the 17<sup>th</sup> century BC (it is called the Minoan Pompeji). The preservation of this site is therefore exceptional, all material present at the time of the eruption was preserved. The site contains magnificent wall paintings and several houses that are still standing over two and three stages. The downside of the excavations is that all houses are cracked by the enormous explosion of the volcano - one of the heaviest volcanic eruptions of the last 5000 years – so that they are very unstable for the moment.

The area on the other hand is an earthquake zone and has major earthquakes every 50 year. The last major earthquake took place in 1956 (the excavations started in 1967). In other words, every earthquake that the site will experience – even a minor one – will cause severe damage to the site. Work has started to record the site with TotalStation, but the results were unsatisfactory. The excavated area is over 2 hectares, and completing the site with the current method would take several other manyears.

Image recordings were made of a part of the site to test the image-based modeling technique, as an alternative to the current approach. When the roof of the site will be completed in year 2, this alternative will be further discussed. When positive, the brokerage activity will provide the necessary support to do this project with EPOCH technology (see for example showcase 8).

A second project was a laser scanning project of an endangered rock art site in South Africa. Involved partners were the University of Cape Town and the University of Bristol. In the appendix, the brokerage agreement and the intervention report is provided. The data of the intervention will be made available on the EPOCH website, under the conditions of the download agreement (paragraph 3.2).

Through a visit at UNESCO, an analysis was made to find more funding for endangered sites. Several European countries have already provided a budget for endangered sites and disasters that affect cultural heritage. When necessary, these countries ask for the appropriate specialists to intervene, supported by these budgets. UNESCO has a database of 22.000 specialists for these matters. An effort will be made in the second year to make a call for specialists within EPOCH, and add these to the UNESCO database.

#### **2.4. Data Repository**

A fourth action within the brokerage is the provision of a data repository, in which data sets and software can be deposited. Download of items in the repository are subject to an approved download agreement that states that the downloaded datasets or software can be used for research purposes only (see paragraph 3.2).

Several datasets were prepared for download. Most of them are laser scans in multiple resolutions. A contract is being prepared for software download. Juridical assistance is sought for this. Several softwares are available for download.

A special case here are the reference collections. The ROB (Archaeological Service of the Netherlands) has an extensive reference collection in preparation. Contact was made with the ROB to make a part of this collection available in digital form. As the ROB will probably become EPOCH partner soon, this reference collection will be further investigated in year 2.

### 3. Contracts

#### 3.1. **Brokerage agreement – Endangered sites**

Intervention of EPOCH partners at endangered sites can be funded if this intervention contributes to the safeguarding, sustainable protection or recording of the site, if the intervention is based upon the use of technological means, if the site or parts of the site are clearly endangered and if the results of the intervention become available to the EPOCH partners for further research.

#### Identification of partners

##### **Applicant of the intervention (please complete):**

Responsible:	
Name institution/organisation/enterprise:	
Position and/or function:	
Address (street, number, postal code, country):	
Tel.:	
Mobile:	
Fax:	
E-mail:	
Website address:	

##### **Other involved partner(s) (please complete):**

Responsible:	
Name institution/organisation/enterprise:	
Position and/or function:	
Address (street, number, postal code, country):	
Tel.:	
Mobile:	
Fax:	
E-mail:	
Website address:	

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### Brokerage project description

#### **Conceptual approach** (replace bullets by your text)

- Give a short description of the site.
- Give a short description of the planned intervention.
- Describe and explain the technologies used. What is the methodology?
- What are the main objectives of the project?

#### **Financial plan** (replace by your text)

Describe the expected costs of the intervention.

#### **Motivation** (replace bullets by your text)

Describe your motivation for obtaining funding by answering following questions:

- Why is the site of the planned intervention endangered?
- Which are the expected results? How does the intervention ensures or improves safeguarding or protection of the site, or if no safeguarding or protection is possible, how complete does the recording represent the site ?
- What is the added value of your intervention for the EPOCH network by keeping in mind its main objective “unifying technology and cultural heritage in an integrated way” ?

Requirements towards the EPOCH community

The obtained results need to be useful as input for the EPOCH project. By signing, you give your approval on the following issues :

- A report of the project and a description of the data and results need to be made within 2 months after finalising the intervention.
- The collected data and results need to be available to all EPOCH partners within 2 months after the finalisation of the intervention. We have planned the following dissemination:
  - Putting the results on the EPOCH website and make it possible for downloading. A signed download form ensures the proper use of the results (see attachment)
  - Presentation of brokerage projects at VAST or CAA conferences, we appreciate a presentation of the results at one of these conferences
  - We appreciate dissemination of the results through a training, open to all EPOCH-partners. This training can also be supported by the EPOCH mobility and course budget

By signing this agreement you agree with all mentioned conditions and confirm that all given information is correct.

Date

Signature of responsible (see above)

Please send this agreement by post to the brokerage responsible:

Ename Center for Public Archaeology and Heritage Presentation - EPOCH  
Att. of Heidi Tency  
Abdijstraat 13-15  
B-9700 Oudenaarde

For further information:

[Heidi.tency@enamecenter.org](mailto:Heidi.tency@enamecenter.org)

Tel. + 32 55 23 24 45

Fax + 32 55 30 35 19

### **3.2. Brokerage download form**

To get the permission to download brokerage data, you have to fill in this form to provide a detailed motivation. If you agree with the conditions, you have to sign this form and send it to the EPOCH brokerage responsible (see below). After review and evaluation you will receive a username and password which allows you to download the data.

#### Conditions for downloading

Downloading is only permitted by observing the following regulations:

- The data remains the property of the owner, only a right to use the data is granted by downloading the data
- The data are only available for scientific research and benchmarking to EPOCH members.
- All commercial use of the data is forbidden. The applicant must ensure the confidential use of the data within his/her organisation, no transfer of the data outside the organisation of the applicant is allowed.
- When publishing results of this scientific research or benchmarking, the owner of the data needs to be acknowledged. If the results of the scientific research are new datasets, it is highly appreciated if these datasets are made available to the brokerage service for further use within the EPOCH community
- The applicant has to give a well-founded motivation for obtaining data.

#### Identification of the applicant

Name:	
Name institution/organisation/enterprise:	
Position and/or function:	
EPOCH partner number:	
Address (street, number, postal code, country):	
Tel.:	
Mobile:	
Fax:	
E-mail:	
Website address:	

### Data categories

Datasets are classified into different categories. Permission to download is granted for a full data category. Each dataset has a unique id. Choose the category from which you prefer to obtain data and add the data set id:

- 3D scanning data:
- 3D models:
- Digital photographs:
- Software:
- Archaeological records:
- Other datasets:

### Motivation (replace the bullets by your text)

Describe below your motivation for the use of the data by answering the following questions:

- Describe the research or benchmarking you want to perform on the datasets
- Which are the objectives you expect to reach with the research?
- Why did you choose these specific datasets ?
- What is the added value of your research for the EPOCH network by keeping in mind its main objective “unifying technology and cultural heritage by an integrated way” ?

By signing this form you agree with all conditions mentioned and confirm that all given information is correct.

Date

Signature

Please send this form by post to the brokerage responsible:

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Tav Heidi Tency

Abdijstraat 13-15

B-9700 Oudenaarde

For further information:

[Heidi.tency@enamecenter.org](mailto:Heidi.tency@enamecenter.org)

Tel. + 32 55 23 24 45

Fax + 32 55 30 35 19

## 4. Appendices

The Cederberg project received support from the Endangered Sites unallocated budget. Hereafter

- the brokerage contract and
  - the report of this intervention
- can be found

## Brokerage agreement – Endangered sites

Intervention of EPOCH partners at endangered sites can be funded if this intervention contributes to the safeguarding, sustainable protection or recording of the site, if the intervention is based upon the use of technological means, if the site or parts of the site are clearly endangered and if the results of the intervention become available to the EPOCH partners for further research.

### Identification of partners

#### Applicant of the intervention (please complete):

Responsible:	Alan Chalmers
Name institution/organisation/enterprise:	University of Bristol
Position and/or function:	Professor
Address (street, number, postal code, country):	Department of Computer Science, Bristol, BS8 1UB, UK
Tel.:	+44-117-9545150
Mobile:	
Fax:	+44-117-9545208
E-mail:	Alan.Chalmers@bris.ac.uk
Website address:	www.cs.bris.ac.uk/~alan

#### Other involved partner(s) (please complete):

Responsible:	John Parkington
Name institution/organisation/enterprise:	University of Cape Town
Position and/or function:	Professor
Address (street, number, postal code, country):	Department of Archaeology Private Bag, Rondebosch 7701, South Africa
Tel.:	+27 21 650-2353
Mobile:	
Fax:	+27 21 650-2352
E-mail:	jep@age.uct.ac.za
Website address:	http://web.uct.ac.za/depts/age/people/parking.htm

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### Brokerage project description

#### Conceptual approach (replace bullets by your text)

- The Cederberg region of Southern Africa is one of the richest regions of rock art in the world. The site investigated, is data at approximately 3,500BC and is set high up in a steep cliff overlooking the Rondegat River in the northern

Cederberg, figure 1. The site is unique, containing well preserved very unusual female figures, figure 2.

- The plan is to do capture a very detailed photographic record of the site and its location and carry out a high resolution laser scan of as much of the site as possible.
- The data on site will be captured by Cannon D30 camera and a Minolta 900 laser scanner. The high quality digital photographs will be stitched together to form panoramas of the site and its surroundings. The dense samples of 3D points obtained from the laser scanner will be joined together to achieve a full three dimensional model of the site. In addition, light probes will be used to record the lighting at specified points of time at the site. This information will be used to later validate the virtual model and lighting simulations of the site.
- The objectives are two fold:
  - To obtain a full, detailed record of the site in order to monitor the site in the future for conservation purposes. A preliminary version of some of the scanned data can be seen in figure 3 (a) without texture, and (b) with texture.
  - The position and nature of the site raise some intriguing questions as to the purpose of the site and the paintings. Figure 4(a) shows one of the paintings at the site, the so called “purple lady” at 10am in November, while figure 4(b) shows the same painting at 10am in March. As can be seen, in March at this time of the morning, the shadows caused by the natural shape of rock on the outside of the shelter almost perfectly frame the figure on three sides. What the archaeologists would like to investigate is whether there were certain times of the day or year when the shadows cast from both the sun and moon, highlighted the paintings in anyway. A detailed 3D laser scanned reconstruction of the site, together with high fidelity computer graphics, will allow us to put the sky back as it was 5000 years ago and explore this question.

**Financial plan** (replace by your text)

Describe the expected costs of the intervention.

Airfares: 3 people @ £673+£115 (tax)	£2,364
Car Hire to transport people and equipment from Cape Town to site	£ 273.38
Accommodation at site (R2500)	£ 224.24
Subsistence 3 x £10 a day for 4 days	£ 120.00
<b>Total</b>	<b>£2,981.62</b>

**Motivation** (replace bullets by your text)

Describe your motivation for obtaining funding by answering following questions:

- Although quite inaccessible and on a privately owned farm, the site is not protected in any other way and thus there is a very real danger that it may be vandalised. A full three dimensional record of the site will enable archaeologists to determine whether the site has been tampered with at any point in the future.
- The expected result is a full photographic record and three dimensional model of the site reconstructed from the laser scanned data. Although not helping to protect the site directly, as discussed above, the data will enable the site to be monitored over time. In addition, the data will be made available to a wide audience and the completeness of the data will enable the large audience to appreciate this unique site without the need to visit and thus perhaps inadvertently damage the site by their presence.
- This project combines computer science expertise in the form of building accurate virtual models of a site from laser scanned data and creating high fidelity lighting simulations together with the detailed archaeological knowledge of the site and the important questions that need to be asked in order to investigate the site properly.

*Requirements towards the EPOCH community*

The obtained results need to be useful as input for the EPOCH project. By signing, you give your approval on the following issues :

- A report of the project and a description of the data and results need to be made within 2 months after finalising the intervention.
- The collected data and results need to be available to all EPOCH partners within 2 months after the finalisation of the intervention. We have planned the following dissemination:
  - Putting the results on the EPOCH website and make it possible for downloading. A signed download form ensures the proper use of the results (see attachment)
  - Presentation of brokerage projects at VAST or CAA conferences, we appreciate a presentation of the results at one of these conferences
  - We appreciate dissemination of the results through a training, open to all EPOCH-partners. This training can also be supported by the EPOCH mobility and course budget

**Figures**



Figure 1: Location of the site



Figure 2: Some of the images at the site

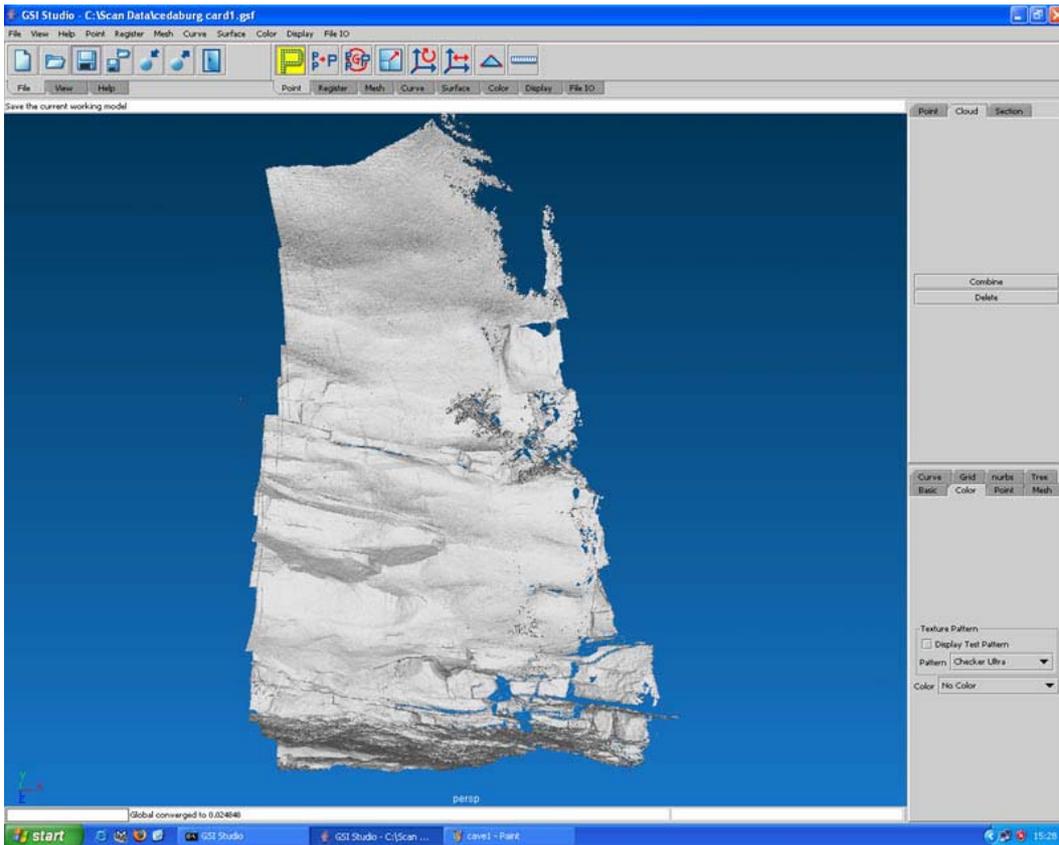


Figure 3(a): Part of the scan without texture

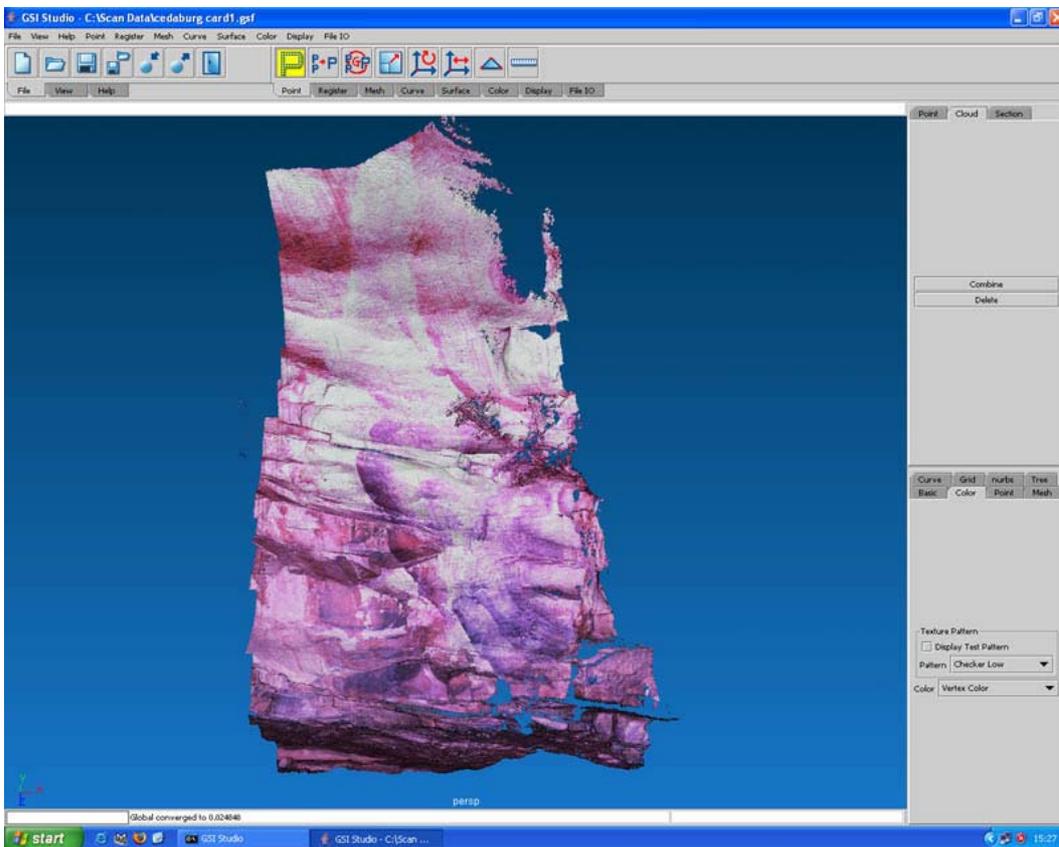


Figure 3(b): Scan with texture



Figure 4(a): Purple lady in November 10am



Figure 4(b): Purple lady in March 10am

By signing this agreement you agree with all mentioned conditions and confirm that all given information is correct.

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# Brokerage Agreement - Endangered Sites

## Recording the Rock Art at Rondegat River Site, Cederberg, South Africa

Alan Chalmers  
University of Bristol, UK

The Cederberg region of Southern Africa is one of the richest regions of rock art in the world. Most of the paintings are in small shelters or rock overhangs in the mountainous landscape. Although this rock art is unique, the many thousands of sites are not protected in anyway and their preservation has largely been a result of them being far from any roads or paths. However, with the increase of tourism in the region, due to its natural beauty, figure 2(a), these sites are now at considerable risk, either due to inadvertent damage during unsupervised site visits or deliberate vandalism. As figure 1 shows, a number of sites have already been damaged by (a) modern graffiti, (b) the removal of parts of the paintings as souvenirs, and (c) the inclusion of modern paintings (in this case an ostrich) at the sites.



Figure 1: Threats to the sites (a) Graffiti (b) Removal (c) Modern paintings

### 1. The site

The site we investigated, is dated at approximately 3,500BC and is set high up in a steep cliff overlooking the Rondegat River in the northern Cederberg, figure 2(b) and figure 3. The site is unique, containing three sets of images [Par03], figure 4. The first is the natural colours of the rock and in particular the red smear embedded in the rock itself. The second are the painted images, well preserved very unusual female figures and elephants done predominantly in red, figure 4(a), except for one lady in purple, figure 4(b). And finally, and quite ephemeral, is the way in which the moon or sun shadow passes across the surface of the rock, drawing attention to some of the images at different times of the day and year, figure 7.

This relatively isolated site is thought to be a “women’s site”, where young girls at the onset of menstruation were instructed in the roles of an adult [Par03]. The unusual female figures have been called by archaeologist Anne Solomon, “mythic woman” [Sol98].

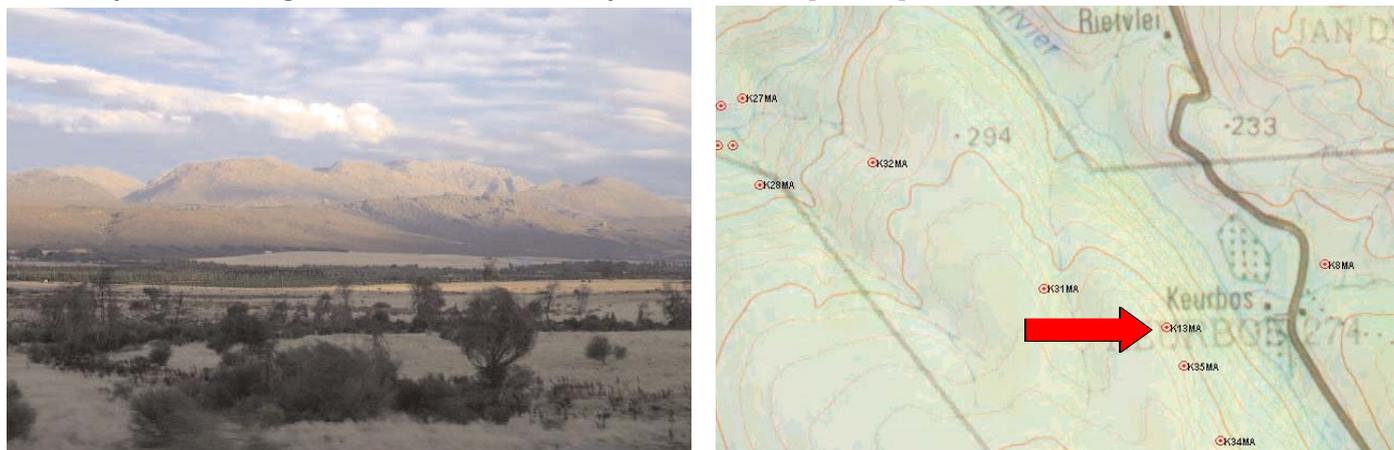


Figure 2: (a) Cederberg landscape (b) Location of Rondegat River site



Figure 3: (a) Location of the site (b) getting the equipment up the mountain

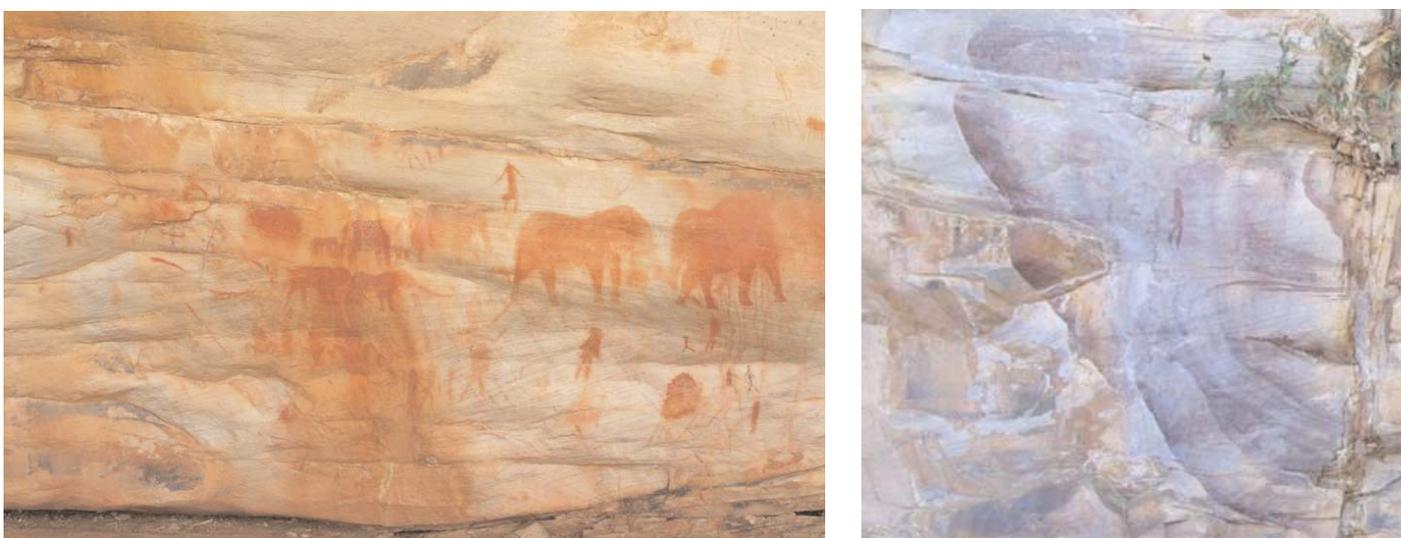


Figure 4: (a) Natural red smear and frieze of women and elephants (b) Single “purple lady”

As the figure 3 shows, the site is quite inaccessible and on a privately owned farm, however, the site is not protected in any other way and thus there is a very real danger that it may be vandalised. A full three dimensional record of the site will enable archaeologists to determine whether the site has been tampered with at any point in the future. A detailed photographic record and three dimensional model of the site reconstructed from the laser scanned data, although not helping to protect the site directly, will nevertheless enable the site to be monitored over time. By referring to this archived record, the archaeologists should be able to determine if the site has been tampered with and what the damage is. It is intended to record the site in detail again in a year’s time. This additional record will enable the archaeologists to also see if the site is deteriorating over time due to natural weathering and, therefore, whether some specific conservation action should be taken.

## 2. Recording the site

The plan was to capture a very detailed photographic record of the site and its location and carry out a high resolution laser scan of as much of the site as possible. The data on site was captured by Cannon D30 camera and a Minolta 900 laser scanner, figure 6.

The high quality digital photographs were stitched together to form panoramas of the site and its surroundings. The dense samples of 3D points obtained from the laser scanner have also been combined to achieve a full three dimensional model of the most of the site. The range of the scan-

ner is approximately 1.5m, which meant that it was not possible to scan the roof of the shelter which is about 3m high, as can be seen in figure 5(a). In future some form of scaffolding would be necessary to record this part of the site. For now this area has been approximated from the detailed photographs taken.

As discussed previously, the lighting within the site appears to play an important role in the perception of the paintings. Figure 7(a) shows one of the paintings at the site, the so called "purple lady" at 10am in November, while figure 7(b) shows the same painting at 10am in March. As can be seen, in March at this time of the morning, the shadows caused by the natural shape of rock on the outside of the shelter almost perfectly frame the figure on three sides. What the archaeologists would like to investigate is whether there were certain times of the day or year when the shadows cast from both the sun and moon, highlighted the paintings in any way.

A detailed 3D laser scanned reconstruction of the site, together with high fidelity computer graphics, will allow us to put the sky back as it was 5,000 years ago and explore this question. In order to do this, light probes, figure 6(b) were used to record the lighting at specified points of time at the site. This information will be used to later validate the virtual model and lighting simulations.

#### 4. Summary

The rock paintings of the Cederberg are a unique record of an ancient hunter-gatherer population who inhabited the region some 5,000 years ago. In addition to degradation due to natural erosion and weathering, the sites are now facing increasing risk due to the growth of tourism in the region and the recognition within the region of the commercial potential of the sites for revenue and job

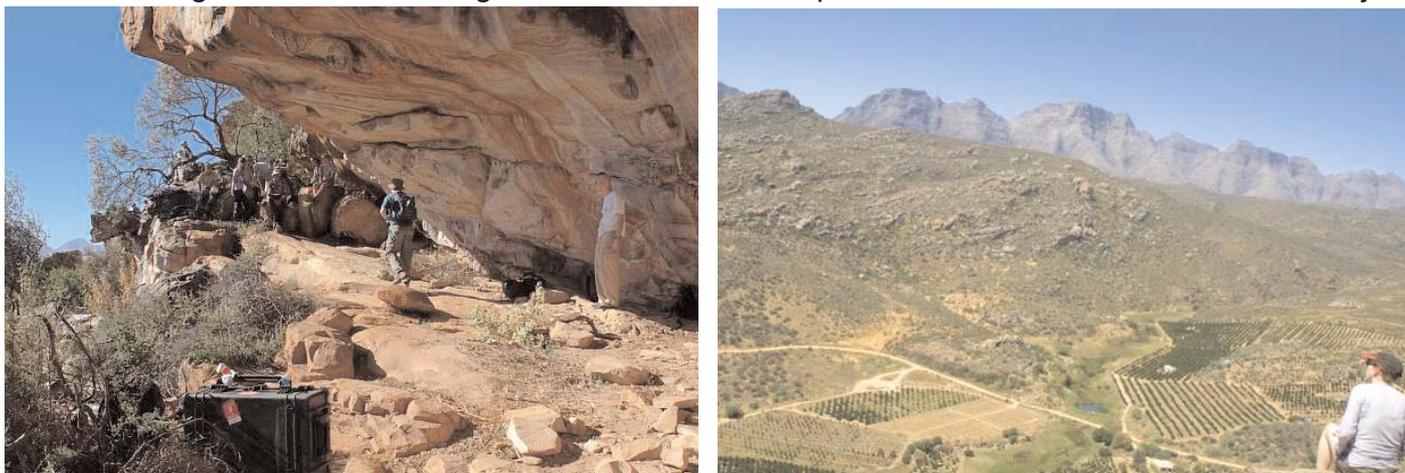


Figure 5: (a) The site, showing its height (b) The view across the valley from the site



Figure 6:(a) Capturing detailed photographic record (b) Light probes (c) Laser scanning the site



Figure 7: (a) “Purple lady” in November (b) “Purple lady” at 10am in March

creation due to community involvement. Such initiatives, are to be welcomed as they provide the opportunity for the local community to have a stake in the preservation of the sites. But the increase of human access to the sites does run the substantial risk of longer term damage, either inadvertent or deliberate. Detailed photographic and laser scanned data provide key archival records of the site and will allow the archaeologists to monitor the site over time. Furthermore, making the data available on the web will enable a large audience to appreciate this unique site. This should in turn encourage further tourism to the region and raise public awareness of the need to ensure the protection of such an important heritage site.

Current research is combining computer science and archaeological expertise to create a high fidelity computer reconstruction, enabling accurate lighting simulations to be carried out in a safe and controlled manner to allow the archaeologists to investigate how the paintings may have been perceived in the past.

## References

- [Par03] Parkington J. “Cederberg Rock Paintings”, Creda Communications, Cape Town, 2003.  
 [Sol98] Solomon A. “The Essential Guide to San Rock Art”, New Africa Books, 1998.

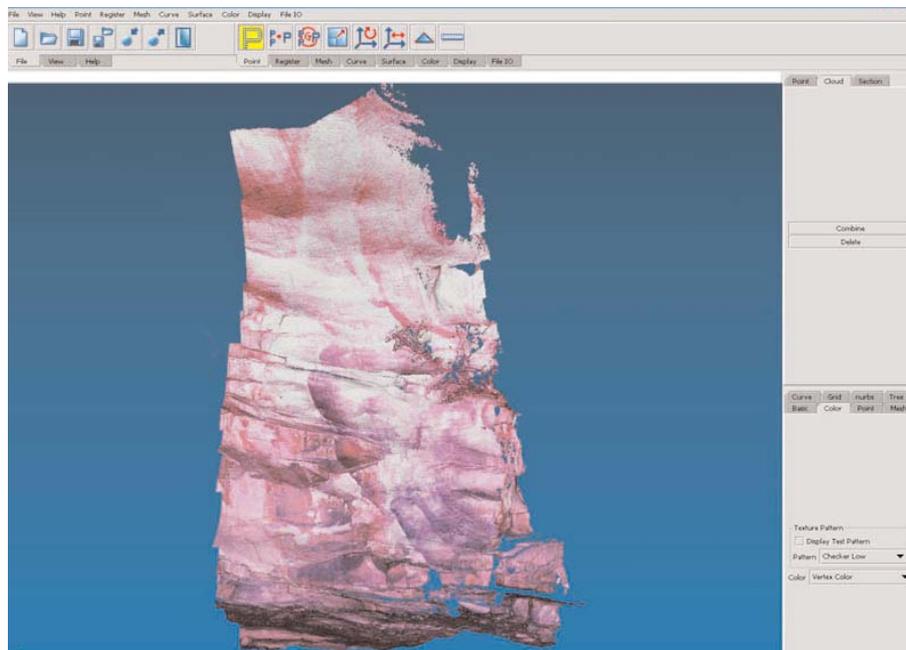


Figure 8: Laser scan of part of the site, including the “purple lady”