

# The Nemrud Dağ Project

University of Amsterdam / University of Nijmegen /  
International Nemrud Foundation

Proposal for the 2003 campaign

Amsterdam, December 2002

His Excellency The Ambassador of Turkey  
Mr. A. Karahan  
The Embassy of Turkey  
Jan Evertstraat 15  
2514 BS 's-Gravenhage

*Nieuwe Prinsengracht 130  
1018 VZ Amsterdam  
The Netherlands*

Amsterdam, December 14 2002  
Your reference:  
Our reference:  
Enclosure(s): attachment 1-4  
Regarding: *Nemrud Dağ Project*

AAC  
Contact:  
Tel.: +31 (0)20-525 2564  
Fax: + 31 (0)20-525 2544  
E-mail: hbrijder@hum.uva.nl

Your Excellency,

Herewith I have the honour to present you the application for the license to carry out the third campaign of our Nemrud Dağ project for the restoration, excavation and protection in accordance with:

The decision of the Minister's Council no. 2001/2898 / Prime Ministry of the Turkish Republic as stated in the letter of the General Directorate for Laws and Decisions no. B 02.0.K. KG / 153-9 / 4074 (attachment 1).

This year we will start a large restoration and protection program for the sandstone reliefs on both the terraces and for the colossal statues on the East Terrace.

The Projectmanagers are Prof. Dr. Herman A.G. Brijder (University of Amsterdam) and Prof. Dr. Eric M. Moormann (University of Amsterdam/University of Nijmegen), the assistant acting Projectmanager is Dr. M.J. Versluys (University of Amsterdam).

Enclosed are:

- A general description of the goals and objectives of the Nemrud Dağ Project (attachment 1).
- A detailed plan for the 2003 campaign (attachment 2)
- The C.V. and a list of publications of Prof. Dr. Herman A.G. Brijder including scientific experience and specialisation (attachment 3).
- The C.V. and a list of publications of Prof. Dr. Eric M. Moormann including scientific experience and specialisation (attachment 3).
- The C.V. and a list of publications of Dr. Miguel J. Versluys including scientific experience and specialisation (attachment 3).
- The team list and the C.V. of each member (attachment 4).

We would like to start the project at the first of June 2003 and to work for two months until the end of July. We hope to be enabled to arrange some facilitating works regarding the infrastructure (restoration house) before that period.

I hope you find this information satisfactory. In case you might have any questions or remarks, please contact us.

Yours sincerely,

Prof. Dr. Herman A.G. Brijder  
(project manager / chair Classical Archaeology, Amsterdam)

Prof. Dr. Eric M. Moormann  
(project manager / chair Classical Archaeology, Nijmegen)

## **ATTACHMENT 1    The Nemrud Dağ Project: goals and objectives**

The goals and objectives of our project are shortly described below. Also included are:

1. a general restoration and conservation plan for the sandstone objects to be executed in the next years,
2. a general restoration and conservation plan for the colossal statues on the East Terrace to be executed in the next years: this will explain our end goal for the restoration and conservation of this terrace, and
3. a general planning for the next 8 years roughly indicating our end goal of the project.

### **Objectives**

#### **1 Protection and documentation of the site**

As stressed in different scientific publications and as clearly shown by our own scientific documentation during the 2001 and 2002 campaigns the monument on Nemrud Dağ is in need of protection and restoration. In accordance with the European Code for Restoration the first step is a systematic documentation and survey of the monument to document the present situation.

#### **2 Conservation and restoration of the site**

Now that documentation is available for the most part, the UvA, INF and WMF (World Monuments Fund) have organised a roundtable dedicated to the conservation of the monument (Kahta, Adiyaman july 2001 and Amsterdam november 2001). Participants were the archaeologists from the University of Amsterdam involved, representatives of the Ministry of Culture, the INF and international conservation specialists. On the basis of these meetings a proposal for the conservation and restoration of the monument was formulated. Together with the experiences of the 2002 campaign, and taking into account suggestions from members of the METU University (Ankara) and the Adana commission given to us during the 2002 campaign, this proposal was evaluated and re-formulated during a meeting held at the University of Amsterdam on 10 and 11 November 2002. Prof. Dr. O. Bingöl (University of Ankara) was one of the participants and advisors. In close co-operation with the different parties involved a long-term restoration and conservation plan was now defined (see attachment 1 and 2).

#### **3 Excavation of the tomb of Antiochos I**

This item will be the last objective to be executed and has not our primary interest, as the priority of the project are the objectives 1-2. Before any serious work can start an infrastructure will be required to enable modern and efficient working methods.

## **General conservation and restoration plan for the sandstone elements from Nemrud Dag**

### **Introduction: general outlines of the program**

*All tuffit elements are in very bad condition and in need of protection, conservation and restoration.*

*It is therefore our intention to bring them to the on-site restoration atelier where they will be conserved and restored. After that they should be exhibited in the (future) site museum while on their original position copies should be placed.*

The very bad condition of the reliefs becomes most clear, of course, from the Lion relief and the *dexiosis* stelae on the West Terrace. However on this terrace and on both the other terraces (East Terrace and North Terrace) there are more sculptured tuffit elements now quickly deteriorating: ancestor and/or other reliefs and guardian animals.



Heracles-dexiosis relief as preserved in 2001

In the last campaigns most of the tuffit elements were documented as part of the Site Information System. During the 2003 campaign we will finish this documentation. Thereafter it is our intention:

- to protect the elements by pre-conservation (as, for instance, in case of the Lion relief or the *dexiosis* reliefs) or (as, for instance, in case of the guardian animals) to collect all pieces of sculpture and document them before proceeding with conservation and restoration.
- to conserve the elements. In the 2001 and 2002 campaigns the team's restorer (Paolo Pagnin) has studied the tuffit and methods as to its conservation. This has also been done in the 2002 campaign by a team from the Geological Institute of the University of Aachen (Germany). We now have thus a fair knowledge of how to treat the stone.
- to restore the elements, where possible. The *dexiosis* reliefs and ancestor stelae have nowadays been badly preserved. There are, however, many fragments of the reliefs very well preserved in the storerooms of the Museum of Adıyaman. Last year we started an inventory of this material (see *infra*). In the next years we will thus have a database showing which fragments we have to our disposal for the restoration of the reliefs. As it is clear that an in situ display of the vulnerable tuffit reliefs and other sculptured elements is very bad for their condition, we propose that, after their protection, conservation and restoration, they will be displayed in the (future) site museum. In the in situ situation replica's will have to be placed.

For this process of documentation, protection, conservation and restoration we are in need of a restoration house on the site. Here the reliefs or other elements can be brought for their conservation and restoration treatment. This way the risk of the treatment to the vulnerable and unique reliefs will be as minimal as possible: to transport them to some laboratory elsewhere would be dangerous. The restoration project will be undertaken in close co-operation with Professor Orhan Bingöl from the University of Ankara and D.T.C.F., with Christoph Kronewirth (Trier) who has gained great experience at several archaeological sites in Turkey and with Dr. Eberhard Wendler. It is our intention that the conservation and restoration project will be a joint Dutch-Turkish enterprise that will also function as a training program for Turkish and international students in the discipline.

### **Sandstone elements at Nemrud Dağ: what needs to be done**

This section describes and illustrates what kind of sandstone elements have been preserved, where they are located and how they have been preserved. Based on this inventarisation a proposal for tasks urgently to be undertaken in the 2003 campaign will be presented in attachment 2.

### **East Terrace**

On and in front of the lower platform (in front of the statues) there are many sandstone blocks and slabs. Most of them belong to the revetment of the platform. There are, however, also some (fragments of) reliefs.

On the south side, behind the altars for the Greek ancestors, are still lying some of the corresponding ancestor reliefs. Also (fragments of) reliefs of the smaller socle are still in situ.

On or next to the structure that is known as 'the fire altar' originally guardian animals from sandstone were placed. Remains of these are still lying or standing next to the structure or on the slope behind it and have to be collected and preserved: eagle (on the south side); lion and eagle (on the north side).

On the north side, behind the altars for the Persian ancestors, are still lying some of the corresponding ancestor reliefs. Also (fragments of) reliefs of the smaller socle are still in situ.

#### **North Terrace**

In front of the terrace there was originally a platform from large, sandstone blocks on which a guardian eagle was placed. Remains of this eagle are still lying on the slope and have to be collected and preserved.

None of the reliefs lying on this terrace shows sculpted elements.

#### **West Terrace**

The *dexiosis* reliefs and the Lion horoscope are in very bad condition and need conservation as soon as possible. To protect them from falling by the pressure of the winter snow (as happened with one of the stelae during the winter of 2001/2) we made a temporarily shelter during our 2002 campaign. The reliefs, however, need to be properly protected and conserved and brought to the (future) on-site museum.

On the north side of the terrace are lying the remains of reliefs from a smaller socle that have to be protected. On the slope of this side of the terrace there was originally a three headed guardian lion; remains of this lion still lying on the slope and have to be collected and preserved.

On the south side of the terrace, behind the altars for the Persian ancestors, are still lying some of the corresponding ancestor reliefs.

Note that detailed proposals for what we want to do in the 2003 campaign are presented in attachment 2.

## **General restoration and conservation plan for the colossal statues on the East Terrace to be executed in the next years**

This plan defines the general outlines of our program and also indicates also how we want to execute these objectives.

Note that detailed proposals for what we want to do in the 2003 campaign are presented in attachment 2.

### **Introduction: general outlines**

*Structural consolidation, repair, strengthening and reconstruction are done with due respect for international conservation standards. 'Minimum intervention – maximal protection' can be seen as our main rule. This implies that nothing will be altered in the existing situation if such an intervention is not absolutely necessary for the protection of the statue. It is our intention to protect the monument by conservation and restoration; not to rebuilt all the statues. Nemrud Dağ must stay a fascinating archaeological site, but a documented, restored and protected one.*

### **Seismic safety criteria<sup>1</sup>**

Seismic structural stability of the monuments should be taken into account according to the maximum expected ground acceleration in the region and defined criteria of stability and safety. Experimental investigation and testing will be highly appreciated, especially in the later phase of the project, but they are not “conditionally necessary”. Analytical modelling, as well as appropriate calculation and design, however, provide enough safety. Basically, it can be concluded that the original structure of the sculptures, although constructed of massive large stones and dry masonry, possesses extensive lateral seismic resistance.

Nemrud is situated at a distance of over 200 km from the North Anatolian Fault, but it is in the immediate vicinity of the East Anatolian Fault (at a distance of 5-10 km). According to the seismic zoning map, an official document and a constituent part of the regulations, the entire territory of Turkey is divided into four seismic zones. According to this map, Nemrud is located in the 1st zone of the greatest possible earthquake effects with expected intensity of IX degrees MCS or effective ground acceleration of  $I = 0.40 \text{ g}$  (g - earthquake acceleration).

These data point to the fact that the said location is a seismically active area, which should be taken into account in the reconstruction of the structures.

The Codes for Protection against Earthquakes have been effective since 1996 as an official document of the Ministry of Public Works - Turkish Government. The Codes define the expected seismic effect according to the Seismic Zoning Map and provide elements for analysis and providing safety of structures. According to these regulations, the effective ground acceleration is:

Zone 1:	$A_0 = 0.40 \text{ g}$ ;
Zone 2:	$A_0 = 0.30 \text{ g}$ ;
Zone 3:	$A_0 = 0.20 \text{ g}$ ;
Zone 4:	$A_0 = 0.40 \text{ g}$

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<sup>1</sup> This section is based on the report by WMF/INF Consultant Prof. Dr. Predrag Gavrilovic, *Structural Consolidation of Nemrud Sculptures. Mission Report 2002.*



The above values refer to earthquakes with a return period of 500 years. The Codes do not specify any particular conditions for historic monuments and structures of this kind. Considering the fact that all the regulations for seismic protection are basically established for new structures, it is necessary to define special conditions and criteria for seismic stability of structures belonging to a specific category as are the historic monuments and other structures, taking into account the expected seismicity, the importance of the monuments, the structural systems and the materials used.

Taking into account the seismicity of the region and the site and the type of monuments and structures, the following safety criteria are proposed:

- For the expected effect of earthquakes with a return period of 500 years and effective ground acceleration of  $A_0 = 0.40$  g, the monuments behave suffering no damage to the integral structure or individual parts. This means that the integral structural system behaves in the linear range. This level should be considered designed level of safety.
- For the expected effect of earthquakes with a return period of 1000 years and effective ground acceleration of  $A_0 = 0.50 - 0.60$  g, damages to the structures should be allowed but the structure should be repairable and the general stability of the structure thoroughly preserved. This means that nonlinear behaviour and partial damage can be allowed under such effects, but the structure should remain stable as a whole. This earthquake level should be treated as a controlling one, i.e., it should serve for verification of the stability of the structures against failure and severe damage.

### **crane<sup>2</sup>**

The use of cranes in conserving historic monuments is increasing throughout the world. At Nemrud Dağ the crane shall be used for “transport”, while lifting or hoisting is to be done in the traditional way and with traditional materials, which are less likely to cause further damage. To make the access roads for the crane, the principle of “temporary works” should be used instead of monolithic “cast in situ” concrete, or other invasive methods. The weight of the crane, amounting to 42 tons, and the microtremors produced cannot affect the stability of the statues considering that they represent massive, heavy and rigid structures. It must be stressed that during the 2002 season the crane did not induce any damage nor it created conditions for any consequences in the process of its transport and operation; quite the contrary. The telescope crane with a capacity of 42t has extraordinarily good technical characteristics providing the possibility of precise handling, controlled lifting and transportation of the stone heads and blocks. The computerized control structure of the crane enables preciseness in motion in all the directions measured in millimeters as well as desired speed of motion. The additional crane equipment consisting of a system of plastic ties for binding of objects and their transportation is of a particular quality and has a soft contact surface so that no damage can be induced upon contact with stone surfaces.

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<sup>2</sup> This section is based on the report by WMF/INF Consultant Prof. Dr. Predrag Gavrilovic, *Structural Consolidation of Nemrud Sculptures. Mission Report 2002.*

This section presents a general plan for the conservation and restoration of the statues on the East Terrace. The following definitions are used:

Documentation=taking photographs and making drawings to be included in the SIS

Stabilization bedrock/base = inserting hydraulic mortar (if necessary) and adding stones

Insertion new stones=(if required/necessary) missing elements or blocks will be made by stone cutter from similar but distinguishable material from the area

East Terrace Statue A (lion):

- Situation

Remains of the statue are lying beside the original location towards the south side on the steep slope. The blocks are only partly visible due to gravel that has fallen down from the tumulus.



remains of the tumbled down statues A and B (lion and eagle)

Eight blocks have been identified as (probably) belonging to the statue: layer 2 is preserved in total (A2a, A2b and A2c); from layer 3 three blocks are still present (out of four) (A3a, A3b, A3c); from layer 4 one block (A4a) is present (out of two), as from layer 5 (A5a); the head has so far not been identified.



remains of statue A (lion)



block 5: A2a (lion)

- Proposed intervention
  - Removal of all blocks on the south slope and temporarily storage on East Terrace.
  - Removal of gravel.
  - Subsequent documentation and identification of the single blocks.

- Stabilization of bedrock; restoration and reconstruction of base.
- According to the outcome of research done on state of preservation and identification: reconstruction of the statue in a subsequent year. It is likely that new pieces are to be added; it is, however, impossible to say which pieces are missing as the blocks are largely buried under the gravel and identification/inspection will only be possible when they can be lifted.
- Restoration: not clear for the reason mentioned above. Some blocks clearly show damages.

- **Proposed intervention to be executed in the 2003 campaign, see attachment 2**

East Terrace Statue B (eagle):

- **Situation**  
Remains of the statue are lying in front of the original location and on the steep slope to the south-east side. Nine blocks have been identified as belonging to the statue. In all probability identified: all elements apart from block B4b.





remains of statue B (eagle)

- Proposed intervention
  - Removal of all blocks and temporarily storage on East Terrace.
  - Removal of gravel.
  - Subsequent documentation and identification of the single blocks.
  - Stabilization of bedrock; restoration and reconstruction of base.
  - Reconstruction of the statue. There are some uncertainties as to our identification of the individual blocks as the remains are partly buried under the gravel and identification will only be possible when they can be lifted. If it turns out that block B4b has not been preserved under the gravel, it has to be newly made and added
  - Restoration:
    - Block B2a =block no 12 (right paw) has to be restored: insertion of (newly made) stone.

**Proposed intervention to be executed in the 2003 campaign, see attachment 2**



Block 12: B2a (eagle)

Block B5a (right breast) has to be restored (pasting)



Block 23: B5a (eagle)

#### East Terrace Statue C (Antiochos):

- Situation

Statue is intact and standing upright; only the head is standing in front, on the terrace. The state of the Antiochos statue can be assessed as critical and structural instable because of the large displacements of stone blocks, particularly manifested through the vertical separation: the gap on the south side. Possible minimal motions caused by natural phenomena or man might lead to abrupt progressive failure of the entire statue. Certain contacts, i.e., supports of stone blocks from the inside part are so weak and critical that they require urgent and immediate intervention for structural stabilization.

Emergency/temporary structural stabilization was proposed to be done in the 2002 campaign by extensive support by timber blocks on the inner side and connection by steel ties on the lateral – external side. Steel ties or any other ties were not allowed to be used on the external side of the statue however. Therefore, the stabilization done in 2002 basically consists of supporting the statue by timber struts with timber cramps. Not only is this intervention temporary but insufficient as well.



Statue C (Antiochos) as preserved in 2001



Head of statue C (Antiochos) (block. nos. 17 and 50) as preserved in 2001

- **Proposed intervention to be executed in the 2003 campaign, see attachment 2**



Block C3b (Antiochos)



## East Terrace Statue D (Kommagene)

- Situation

Statue is largely intact up till layer 4: these parts are well preserved. The breast piece (originally two pieces (D6a and D6b), now three because one has been broken), head and *kalathos* are on East Terrace. Blocks from layer 5 have partly been transported to the terrace in front; one big piece of this layer is still lying behind the statue. Structure and base have to be stabilised as some of the blocks are twisted from their original position.



Statue D (Kommagene) as preserved in 2001 (present state differs; breast piece is now on the terrace)

- Proposed intervention

- Stabilisation of base.
- In situ stabilisation of the statue.
- The head, deteriorated by algae, has to be treated/restored.



the head of statue D (Kommagene) (block no. 19) as preserved in 2001

The *kalathos* has to be restored by pasting and the use of small pins.



the kalathos of Kommagene (block. no. 26) as preserved in 2001

- **Proposed intervention to be executed in the 2003 campaign, see attachment 2**

#### East Terrace Statue E (Zeus)

- **Situation**  
Statue is largely intact and standing upright; only the head and the *tiara* are on the terrace. It has a visible dislocation of a stone in the body part and knows the

occurrence of vertical separations. This points to initial "general instability" that has resulted also in crushing of the stone blocks in the lower rows.



statue E (Zeus) as preserved in 2001

- Proposed intervention

- In-situ stabilisation

- Subsequent documentation.

- Stabilisation of base.

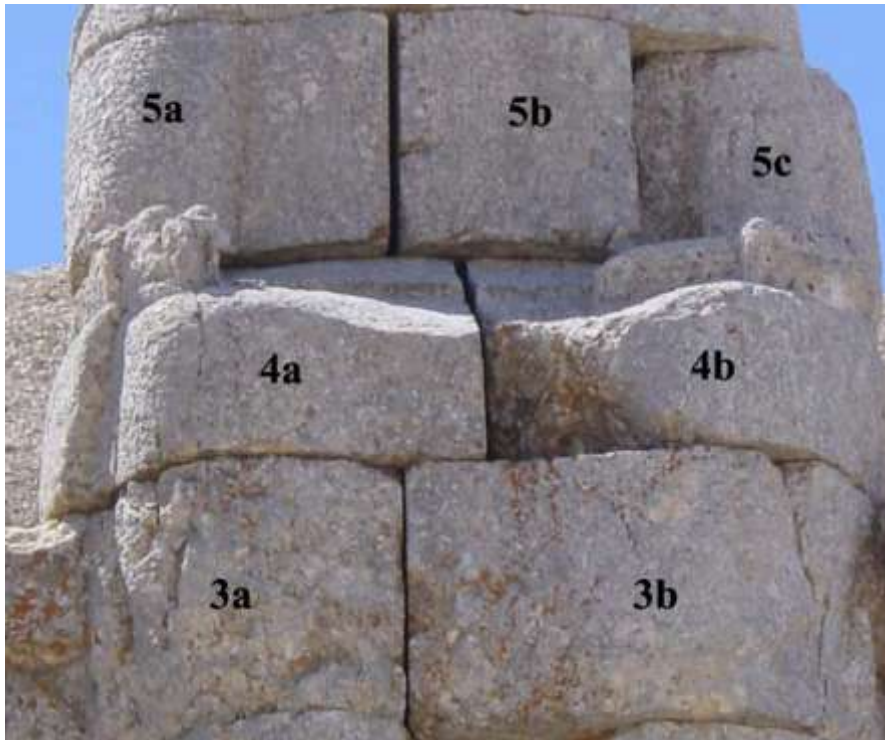
- Restoration:

Block E3a (front) is damaged at the front side.

Block E3b (front) is damaged at the left lower side.

Block E3d (back) is damaged at the left lower side.

Block E4b (front) is damaged at the lower left side: a newly made piece of stone will be made and fixed.



statue E (Zeus): layers 3, 4 and 5





head of statue E (Zeus) (block no. 25) as preserved in 2001

The tiara has to be restored (pasting newly made pieces) on two sides and has to be fixed onto the head.



part of tiara of statue E (Zeus) (block no. 20) as preserved in 2001

### East Terrace Statue F (Apollo)

- Situation

Statue is largely intact and standing upright; the shoulder piece and the head are standing on the terrace. Instabilisation of the base has resulted in many vertical separation cracks; the statue is structural instable. Urgent measures for its consolidation are necessary to avoid collapse.



statue F (Apollo) as preserved in 2001



head of statue F (Apollo) (block nos. 27 and 46) as preserved in 2001

- Proposed intervention

- Removal of all blocks and temporarily storage on East Terrace (if absolutely necessary) or (preferably) in-situ stabilisation.

- Subsequent documentation.

- Stabilisation of base.

- Restoration:

Block F2a shows an inserted element (antique restoration?); this block has to be fixed by pasting.



Block F2a (Apollo)

#### East Terrace Statue G (Heracles)

- Situation

Statue is largely intact and standing upright apart from the head; this stands on the terrace. Three types of characteristic damage to the statue have been observed: damages to the principal structural system manifested by displacement of the stone blocks from their original position leading to formation of gaps between the blocks; damages to the stones themselves particularly pronounced on their front side and manifested by local failure or cracks and erosion; and deterioration of bedrock/soil foundation, particularly expressed on the front side.

It is urgently necessary to intervene as the stability of the soil, i.e., bedrock has suffered from considerable deterioration and erosion in the course of time. Such an intervention is imposed by the need to prevent further erosion and make contact between the principal structure and the soil. The cavity caused on the front side might induce failure of the stone blocks leading to progressive failure of the entire structure.

The temporary stabilization done in the 2002 campaign involved the cleaning of the base, the removal of tiny stones and failures and the incorporation of stone blocks in the form of walls and cramps. The new stone blocks basically transfer the load from the structure to the base and prevent occurrence of cracks in the lower stones and failure of the statue. Stabilization of soil was not done. Dry stone masonry was used with the intention that this intervention be temporary and the used material reversible.





Statue G (Herakles) as preserved in 2001

- Proposed intervention

- Removal of all blocks and temporarily storage on East Terrace (if absolutely necessary) or (preferably) in-situ stabilisation.

- Subsequent documentation.

- Stabilisation of base. It is recommended to perform permanent stabilization with improvement of the existing soil by injection of rock mass and incorporation of new, stable and regularly shaped blocks below the existing blocks of the statue.

The contact between the new blocks and the existing ones (belonging to the statue) should be dry, if possible, or should be made by use of hydraulic mortar or lead.

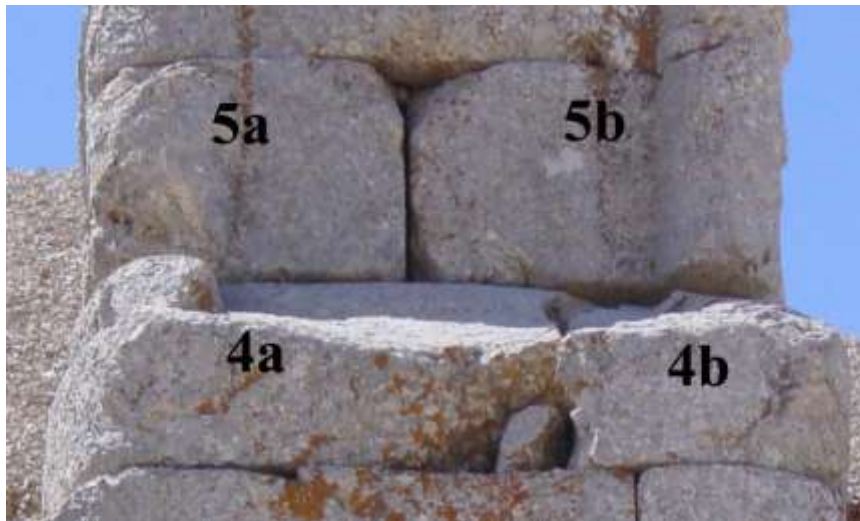


Statue G (Herakles), base before temporarily stabilisation

-Restoration:

Block G4a (lap) should be glued and pinned.

Block G5a and G5b are damaged at the front side on resp. the left and right side: a newly made piece of stone has to be inserted here.



statue G (Herakles), layers 4 and 5

East Terrace Statue H (Eagle)

- Situation

Statue is partly standing upright: layers 1-3 plus block H4b are still *in situ*.



statue H (eagle) as preserved in 2001

All remaining blocks are identified and situated on the terrace (which are: head (H6=block. no. 35), the two chest pieces (H5a=block. no. 30 and 5b=block. no. 31), the belly (H4a=block. no. 29)).



H6=block no. 35 (eagle)



H5a+b=block nos. 30 and 31 (eagle)





H4a= block no. 29 (eagle)

Structure and base have to be stabilised: the middle front base block has to be consolidated. Furthermore the base is largely gone; it can be reconstructed, however, with the original blocks lying around.

- **Proposed intervention to be executed in the 2003 campaign, see attachment 2**



detail base H (eagle): middle front block



detail crack block no. 35 (eagle)

#### East Terrace Statue I (Lion)

- **Situation**

Base is partly standing, but disrupted. Elements of the statue have fallen down the slope. The head and leg parts are placed on the terrace.



remains of statue I (lion) as preserved in 2001

- **Proposed intervention to be executed in the 2003 campaign, see attachment 2**



statue I (lion), head (block no. 44)

## General Planning 2001 - 2010

[illegible]

The 2003 campaign of the Nemrud Dağ Project will have two main points of interest:

1. Protection and conservation of the four *dexiosis* reliefs and the lion horoscope on the West Terrace.
2. Conservation and restoration (and, if necessary, reconstruction) of the statues C (Antiochos) and H and I (lion and eagle) on the East Terrace.

All aspects to be dealt with will be described below as detailed as possible.

## **1.0 Infrastructure**

### **1.1 Site Office**

A temporary site office has been constructed below the East terrace and will also be needed this year.

### **1.2 Storage**

Container storage facilities of two 20 feet containers has been installed next to the Thor container; they will also be needed during the 2003 campaign.

### **1.3 Restoration house** (prepared by M. Crijns & J. Groot)

The sandstone reliefs are in need of immediate protection and conservation (see further infra). As a temporary measurement a snow barriere has been constructed to relief the pressure from the snow load. The condition of the reliefs makes transportation to a museum for proper conservation a high risk. The level of delamination is such that the reliefs may crack further during transport down to the valley. Therefore it has been decided to construct a restoration house on site for the conservation / restoration of the steles and other vulnerable artefacts. After the reliefs have been pre-conserved, they are transported to the restoration house, where they will be conserved as well as temporarily stored.

#### **Location**

Together with the two representatives of the Ministry of Culture present during the 2002 campaign, the location of the restoration house has been determined between the West terrace and the North terrace, at a place where it is unobtrusive, a few meters under the path the tourists use when visiting the site. Attention will be paid that the appearance will fit into the environment of the monument. Therefore the house will be constructed in a traditional way with stones.

#### **Measurements**

The capacity of the house has to meet the requirements of at least the 4 *dexiosis* reliefs and the lion horoscope of the West terrace. Therefore the following dimensions have been chosen: 10 x 6 x 4 meters (length x width x height). In front is a handling platform designed to enable the internal transportation by means of a running crane (see sketches).



### Internal Transportation

A running crane will ensure a safe transportation from the handling platform inside the house (see sketch). The capacity of 6 tonnes is more than enough for hoisting any of the reliefs.

### Tourism

Since the monument of Nemrud Dağ is a site of highly touristic value, it is planned that the visitors will have free entrance to/view into the restoration house during the top visiting hours i.e. early morning (sunrise) and late afternoon (sunset). A future destination of the restoration house can be educational like the presentation of a permanent dia/video show regarding the works done on Nemrud Dağ.

## 2.0 Archaeological documentation

### 2.1 The Site Information System

One of the main goals of the first two campaigns was the compilation of a Site Information System. The SIS has different layers or levels, ranging from a general overview to a specific detail.

The most general level (1) is formed by the topographical map. Many thousands of GPS points have been combined and show the tumulus with its remains and some of the characteristic features directly around it. This level is now ready. Level 2 provides detailed maps of the East- and West terraces with the position of the statues, the tumbled down blocks and most other elements. The level 2 maps consist of a combination of GPS points from the topographical map (level 1) with handmade drawings. This work is almost finished: some small details still have to be added and the plans will be checked one last time before the situation on the terraces will be changed by the movement of reliefs and blocks (see *infra*).

Level 3 presents overview photographs of the terraces. Now the terrace's maps can be visualised from different angles while the placing of the statues and the location of the different groups of blocks becomes more clear. Work almost finished: only some details to be added.

On the fourth level one encounters the colossal statues themselves. Here are drawings that show the statues' structures in different blocks and also indicate which blocks are still in situ. This work, a *conditio sine qua non* for the start of the protection/restoration/conservation program, has been finished.

The statues' tumbled down blocks can be studied on the fifth level. It provides photos of groups of blocks and, after that, of individual blocks. It is combined with a database that shows, amongst other things, our assignment of the blocks. This work, a *conditio sine qua non* for the start of the protection/restoration/conservation program, has been finished. It is, however, possible that our assignment will have to be re-adjusted when blocks are cleared from gravel.

Most of the individual blocks, lastly, can also be found on level 6. Here are scale drawings of blocks with sculpted details, from different perspectives, thus giving more detailed and precise information than the photographs. Also this year we will continue to work on these drawings.

### 2.2 Epigraphy (prepared by O. Van Nijf)

The main aim of the epigraphic research is to provide full documentation of all the inscribed surfaces. The secondary aim is to publish any unpublished inscriptions.

During the 2001 campaign we started on the West terrace where all texts were photographed. We have made squeezes, drawings and descriptions of the "palimpsest" inscriptions at the back of the stelae, and of two small inscriptions that were found on fragments on the West terrace. In the winter of 2001-2002 we have started to collect documentation of all published texts. We have studied the squeezes and the photographs of the "palimpsest" inscriptions. The surfaces are very hard to read due to erasure in Antiquity and to the influences of weather and climate. we have not been able to make significant progress with the decipherment.

The documentation will be entered into a database that will be integrated into the SIS. We have made a preliminary presentation of a small text that was recently found on the West Terrace. During the campaign of 2002 we have completed our photographic documentation of the nomos inscription on the East terrace and of a smaller fragment that was found on the West terrace. We still have to photograph the northern parodos inscription (currently lying upside down near the north parodos) and fragments that are reported to be in the care of the site-attendant.

We have also experimented with a Minolta High resolution 3D Scanner. We have scanned the backside of two stelae on the West terrace (the so-called palimpsests). The first results were promising. However, due to illness and subsequent death of the main operator of the scanner we have not as yet been able to analyse the results.

We hope to resume the scanning of all the inscribed surfaces in the course of the next few campaigns. We expect to complete the documentation of the published texts before the end of 2003. We aim to present the results in the form of an electronic repertorium on the internet.

In subsequent years we would like to extend our project to the region of Kommagene as a whole and include, for instance, other *hierotheseia* like Arsameia and Direk Kale.

### **2.3 Inventory**

No comprehensive inventory of the artefacts from Nemrud Dağ exists. They are scattered over the mountain itself, the villages around and the museums in Gaziantep, Adıyaman, Ankara, Berlin, etc.

During the 2002 campaign we defined an outline for an inventory incorporating all the artefacts from Nemrud Dağ and started studying the material in the storerooms of the museum in Adıyaman and making this accessible by means of a database.

During the 2003 campaign we have to continue this work and finish our database on the artefacts in the Adıyaman Museum. We need this information for the restoration of the sandstone reliefs and sculptures, to be executed in the next years (see *infra*).

### **2.4 Survey**

In the 2001 and 2002 campaigns we executed a small scale pilot survey. The quantity of pottery found around the mountain, however, seems too insignificant to continue this survey on a large scale. During the 2001 and 2002 campaigns we surveyed about 60% of the area around the mountain; this campaign we would like to finish the pilot survey and investigate the remaining 40%, it is the area below the North Terrace and West Terrace.

## **3.0 The conservation and restoration of the sandstone elements: proposal for the 2003 campaign**

As to the conservation and restoration of the sandstone elements we want to do five things during the 2003 campaign:

1. to build a restoration house where the lion horoscope, *dexiosis* reliefs (and, in the future, other sandstone elements) can be stored and treated
2. to pre-conservate the lion horoscope and the four *dexiosis* reliefs so that they can be transported
3. to transport the reliefs to the restoration house
4. to place a plaster copy of the lion horoscope in situ
5. to make a plan for the next campaign to protect the sandstone remains of guardian animals and ancestor reliefs lying scattered on- and around the mountain by bringing them to the restoration house



lion horoscope as preserved in 2001

The building of the restoration house: see above, under Infrastructure

The preconserveration of the sandstone reliefs (prepared by P. Pagnin)

This project proposal has been made after the request of the International Nemrud Foundation (INF) and the University of Amsterdam (UvA) for the occasion of the meeting held in Amsterdam on 10, 11 and 12 November 2002.

The objective of this report is to define the criteria and the practicalities of the work to be performed on the sandstone stelae; whether these should be moved to another location, or if they need to be manipulated in any way before the definitive consolidation is executed.

The stone has been studied by Prof. Fitzner and his team in 1988 and in 2002.

During the field studies it has been noticed that the increase of deterioration was exponential and it has been stated that these elements need an immediate intervention in order to stop their deterioration and, most importantly, the causes of deterioration.

During the Amsterdam Meeting of November 2002 it was also stated that:

Due to the extremely poor state of conservation of the stele, any movement would be dangerous and risk the loss of some of the fragments that are in a fragile state.

The definitive treatment has not yet been defined but an inorganic treatment will be the most suitable.

To define this treatment the best person would be Prof. Eberhard Wendler because of his great experience with inorganic treatments on deteriorated stones.

A restoration house will be set up for the temporary placement of the stele until conservation treatment will be done.

Even if the definitive consolidation treatment has not been defined, the stele need to be placed in a safer location (the restoration house), with a more stable environment, which is not under the direct influence of the weather which is the most active factor of decay.

Prior to any movement some pre-consolidation treatment has to be done to avoid the risk of losing parts of the original material.

#### STATE OF CONSERVATION: THE STELAE

The various stelae of the site are been made out of Tuffite, a sedimentary stone of low resistance and fairly porous, with a high clay content that leads to delamination, the main deterioration pattern.

From the visual examination the delamination and flaking occurs mainly along the sedimentation planes, although in some cases it also occurs across these planes, and can be called contour scaling. In some areas, the stone is very disaggregated and friable.

The state of conservation is very poor indeed, it can be called critical. Many elements are fractured and risk falling, the deterioration is occurring at increasing rates as evidenced from comparison of relatively recent photographs which show details that are no longer present.

Some of the stelae have recently fallen, not for the first time, either by the pressure from snow accumulation on their back and/or from vandal actions, since these stelae, as well as others on the west terrace, are simply standing on a stone base.

#### PRECONSOLIDATION CRITERIA

This operation has to be done only in the case of the necessity of moving the stelae from one place to another. It has to be a temporary solution, left for a relative short time, because often the materials used for a preconsolidation can cause further deterioration if left for too long (microbiological attack, cross linking, lose of their adhesive power, soluble salts etc.)

The preconsolidation has to respond to the following criteria:

- Minimum intervention
- Compatibility of materials used  
Retreatability/reversibility

All these treatments should be used only for limiting the risk of losing original material during their transport, of course it will not completely avoid all risk of loss, because these risks are also linked to the hoisting and the transport methods used. During the lifting any pressure on the surface of the sides of the sculptures has to be avoided, which can cause the most loss due to their fragility. The objects have to be kept as upright as possible and the transportation needs to be conducted without any vibrations to the object. Thus, transporting the objects by ground should be avoided, and if this is unavoidable, ulterior precautions should be adopted.

### PRECONSOLIDATION ACTIONS

The techniques and materials available for preconsolidation are numerous, the important thing is that they correspond to the characteristics described above. The use of the following techniques should be adopted on site and according to their necessity in a case by case manner and decided by the conservator who is carrying out the intervention.

The materials and techniques recommended are:

- Preconsolidation using Japanese paper:  
This technique allows for the protection of areas where the stone has superficial disaggregation (sugaring). This is one of the most common methods used and acts as a first level of protection. The technique consists in the adhesion to the surface of a thin sheet of Japanese paper that surrounds the deteriorated area. The adhesives to be used are numerous, however in this situation a polyvinyl alcohol or a hide glue is most appropriate.
- Gauze for containment:  
This technique is a further step from that of the Japanese paper and is used in order to contain fragments that are at a risk of falling. It consists in the application of strips or sheets of cotton gauze that are glued to the stone in the form of a band-aid or tape, so as to keep all of the elements fixed together. The most suitable type of adhesive to use is hide glue or the acrylic resin Primal AC33, both of which can be completely removed using hot water or steam. Be aware that if this treatment is left for more than a few years there is a risk of an attack of micro-organisms or of shrinkage.
- The use of plaster:  
This method is a further precaution when, apart from the other two techniques described, it is necessary to contain areas that are extremely fractured or in order to distribute external pressure caused during transport in a large area (where necessary, metal bars can be inserted to reinforce the plaster). When using this material, caution must be taken to not allow direct contact with the stone due to problems of salt transfer, insulating the stone from the plaster through the use of gauze, and to assure the mechanical removal of the plaster without creating further damage to the stone.

- Small, partial adhesions:  
This technique is used to: stabilize and/or reinforce large fractures, fix in place flakes, create a bridge along a crack or create resistance to compression forces that could definitively fracture a delicate area. This method can be used either in small areas or with distributed points, in both cases, creating a bridge across the fracture in more than one point in order to stabilize it from any applied pressure. Adhesives best suited for such a treatment are hot glues or epoxy resins, remembering that these adhesions must be localized and that they should not interfere with any future intervention.

## CONCLUSION AND RECOMMENDATION

The use of a preconsolidation treatment is necessary only in the case of the movement and transportation of the stelae, particularly since the materials used for such a treatment have beneficial properties only for a short duration. If such a treatment is carried out, the above recommendations should be followed and applied on a case by case basis, in front of the object, by the on-site conservator and in coordination with those responsible for the transportation of the objects.

Preconsolidation only reduces the risk of loss during transportation, it does not completely eliminate it, requiring constant and extreme care in the handling of the objects even after a preconsolidation has been performed. It is recommended that this treatment and transport of the objects be performed by professionals, in close cooperation with archaeologists and stone conservators.

It is to be remembered that this operation is only the beginning of a long treatment process, which should be completely defined and clarified as soon as possible in order to perform early treatments that will be best adapted for further, long range treatments.

We need to stress the necessity of a long-term project considering the importance of this site and the international visibility and interest that a World Heritage Site provokes.

### The transportation of the pre-conserved reliefs (prepared by M. Crijns & J. Groot)

As described above, the reliefs will first be pre-conserved. Next the steles have to be transported from their present location at the West terrace over a distance of about 75 meters to the restoration house in order to be restored and conserved to prevent further damage. The reliefs are vulnerable and have to be handled with care. Therefore it has been decided to construct for every relief an individual frame (see sketches).

The operation can be described in three phases:

1. Disconnect the steles from their base and lift them up about 0.3 meters.
2. Fit the combined lifting/transporting/storage frames.
3. Lift and transport the reliefs to the restoration house.

#### Phase 1

Special soft hoisting slings of extended width will be used for lifting. In case of insufficient space to put the slings under the steles, wooden wedges will be applied with caution and measures have to be taken to avoid the risk of overturning (see sketch).

Some of the reliefs are connected to their base with (modern) steel pins. These pins have to be cut off before any lifting. Finally the reliefs can be lifted up to 0,30 meters.

## Phase 2

In this phase the individual designed frames are fitted to each stele. The frame is built of two L-shaped steel beams measuring 100 x 200 mm connected with two steel pipes Ø140 mm (see sketch). All connections are to be welded. Softwood is applied between the stele and the steel frame to create a soft surface and to avoid contact between the sandstone and the steel.

## Phase 3

The stele is lifted in backward position by a crane with over-capacity to avoid any shaking of the frame. Before transportation the stelae are secured with additional safety slings.

The lifting and transportation is performed by a mobile crane. The capacity of the crane is 5 tons at 15 meters. The crane approaches the reliefs at the West terrace by the existing path from the North to the West terrace. The path has to be made wider at some places using natural stones.



Placement of a plaster copy of the Lion Horoscope

At the end of the 19<sup>th</sup> century Humann and Puchstein, the earliest explorers of the monument, made a copy of the Lion horoscope that is now in Berlin. Together with the Turkish Ministry of Tourism and Culture we are negotiating to get a plaster cast of this copy that could be erected on Nemrud Dağ.

To make a plan for the protection of the sandstone remains of guardian animals and ancestor reliefs

Many of the sandstone remains of guardian animals and ancestor reliefs are now in danger of rolling down the slopes or vanish otherways. We plan to bring them to the restoration house for thorough documentation and conservation and to study the possibility of restoration during our 2004 campaign. A detailed plan for this operation will be made during the 2003 campaign.

## **The conservation and restoration of the colossal statues: proposal for the 2003 campaign**

As to the conservation and restoration of the colossal statues on the East Terrace we want to do four things during the 2003 campaign:

1. protect and restore the lion and eagle at the north side (statue H and I)
2. undertake emergency measures on the statue of Antiochos (statue C)
3. prepare the restoration of the lion and eagle at the south side (statue A and B) by bringing the blocks on the terrace and clear the spot from gravel.
4. prepare the restoration of Kommagene (statue D) by gluing the quickly deteriorating shoulder pieces.

The restoration of the lion and eagle at the north side (statue H and I) (prepared by P. Gavrilovic)

This project proposal has been elaborated on the basis of the UvA and INF request and the conclusion drawn at the meeting of the representatives of the International Nemrud Foundation (INF), the University of Amsterdam (UvA) and international consultants of the project held in Amsterdam on 10, 11 and 12 November 2002.

The objective of this report is to provide the basis for realization of structural intervention on the north platform and it represents a pilot project. Defined in this report are the structural requirements whereas the stone conservation, archaeological and other aspects are to be treated by the corresponding specialists.

A detailed analysis has been made regarding structural and seismic stability, as the basis for the proposed solution for reconstruction and conservation.

### **1. INTRODUCTION AND GENERAL APPROACH TO CONSERVATION, RECONSTRUCTION AND STRUCTURAL INTERVENTION**

Considering that a decision has been passed at the meeting that a proposal should be made to the Turkish authorities to thoroughly reconstruct the statues of the Eagle and the Lion on the east terrace - north platform involving re-erection of the eagle and lion's heads, it is necessary to take corresponding measures to provide complete stability of the reconstructed statues. To satisfy the criteria of stability and resistance to earthquake effects, a detailed structural intervention is necessary to be taken as to stabilization of the eroded soil, rebuilding of the base up to the lower level of the stone blocks of the platform and complete rebuilding of the platform and the statues. This is imposed as the most rational solution involving complete removal of the stone blocks their sorting on the platform, repair by corresponding conservation treatment and returning of each stone to its original position - rebuilding.

One of the main conservation principles is that the authentic structural system and the structure must be preserved. This means that a dry stone masonry system composed of stone blocks has to be applied in the reconstruction process.

The repair of damaged or fallen stones shall be done by connecting the original parts of the stone blocks. New stone blocks or new parts of stone blocks shall be used only if necessary from the aspect of structural stability. In that case, the new block, or the

new part of a broken block is connected and marked as new one by engraving the year of the intervention (Nemrud Dağ Project (or NDP) - 2003).

Regarding the interventions to be taken for the soil, injection of materials and rebuilding by use of stone masonry in cement lime mortar below the level of the stone blocks of the platform is allowed. The stone blocks of the platform (the first row of stone blocks,) shall rest on a layer of hydraulic mortar. The resting of the stone blocks, due to deterioration and degradation of contact surfaces at parts where gaps might occur and due to the uneven settlement, should be provided with contact by use of hydraulic mortar or lead. (each contact is subject to the judgement of a conservation specialist).

The connection of the eagle and the lion's heads with the supporting lower stone blocks must be made by steel pins in order to provide seismic stability and safety against overturning.

The use of materials for structural repair as are hydraulic mortar, epoxies, stainless steel or carbon fiber reinforcement shall be controlled by stone conservation specialists.

## 2. PRESENT CONDITION AND DIAGNOSIS

The Eagle and the Lion statues are placed on the same platform, which is completely ruined (the lion statue being ruined as well) on the north side, whereas on the east side, there are remains of the Eagle statue ( Photo 1,2 Fig 1,3).

On the north side, the soil has suffered erosion to the extent of failure, whereas on the south one, erosion has taken place within the contact and the surface zone.

The Eagle statue is partially ruined, its lower part composed of large blocks resting on a common terrace consisting of stone blocks filled with crushed stone.

The entire structure is in an extremely critical condition wherefore it requires intervention to halt the process of progressive failure.

Certain stone blocks of the platform are broken and some are displaced on the north side wherefore it shall be necessary to identify them and repair them if necessary prior to their incorporation into the structure.

It should be pointed out that the main material is limestone of good bearing capacity characteristics. The main structural system is dry masonry composed of large stone blocks. The Eagle and the Lion's heads are constructed of a single block resting directly upon the lower blocks (there are no grooves).

In the analysis of the structure and the damages suffered in the course of time, one can distinguish several factors:

(i) Deterioration of the bearing soil at the contact with the surface. All the structures in Nemrud are directly founded - placed - upon the bedrock surface and are not imbedded. In the course of time and due to severe climatic conditions, there took place erosion and considerable deterioration of the bedrock surface layer which affected the stability of the structures. This was the main factor for the failure of both platforms on the east, the north and the south terraces (Photo3);

(ii) Earthquake effects within a period extending to over 2000 years. The Nemrud monuments have certainly been exposed to strong earthquakes considering the seismicity of the region. There are no historical data on the occurrence and the time of occurrence of strong earthquakes. The earthquake effects in conditions of disturbed soil structure have certainly led to failure;

(iii) In addition to the bedrock deterioration, deterioration of stone blocks composing the statues has also been observed, particularly those composing the heads, which being placed on the top, have been the first to fail and have long stayed upon the ground. (Photo 4)

It can be concluded that there has been a mighty interaction of different factors (soil degradation, earthquakes, deterioration of stone, etc.) that have led to total failure.

### 3. RECONSTRUCTION, STRUCTURAL INTERVENTION AND CONSERVATION

The reconstruction and structural conservation process should be carried out in compliance with the main conservation principles, which means preservation of authenticity and minimal intervention.

#### 3.1. Survey, Documentation and Stone Numbering

Prior to beginning of any field interventions, the existing conditions should be inspected in details and documented from the aspect of position of the blocks. A procedure of systematic numeration of the stone blocks should also be established.

#### 3.2. Removal of all Blocks, Temporary Storage and Preparation for Appropriate Treatment

Prior to beginning with removal of the stone blocks, it should be necessary to prepare a base on which all the stone blocks from the platform and the statues shall be put and sorted.

The elevation and the removal of the stone blocks should be done professionally and cautiously in order to avoid damage at the contacts between the equipment and the stone blocks. The use of soft wood, textile and plastic strips will enable the process to be carried out without damage to these contacts. The transportation of the stone blocks after their elevation and their lowering can be done by modern devices as are cranes, elevators, etc. Considering the inaccessibility of the terrain, an automated crane with precise commands and wide range of operation could be efficient. The stone blocks transported onto the base are subjected to corresponding treatment from the aspect of stone conservation, repair, strengthening, connection, cleaning and are thus completely prepared for their incorporation into the structure.

#### 3.3. Stabilization of Ground and Preparation of the Platform Base

It is necessary that the entire terrain be cleaned from all the stones, the stone blocks belonging to the structure being transported to the prepared base and the remaining stones and crushed stones being removed from the surface. After detailed cleaning of the soil surface, it is washed by a strong water jet and then dried by use of compressed air. Such prepared surface is inspected in details with identification of cracks and locations of inner erosion. Considering the presence of surface erosion of lime stone, it is necessary to inject "grouting mixture" into the rock mass under pressure not exceeding 2 atmospheres. Used as a grouting mixture could be a special mixture produced by Sika (Sika grouting mixture 30) or the mixture could be prepared in situ by use of cement mass and fine quartzite sand.

Tests beyond the archaeological locality might be useful.

It is understood that all the archaeological investigations and possible excavations should have been done previously.

In case of a finding of an archaeological interest, the procedure is stopped until the accomplishment of archaeological investigations and other works. Soil stabilization should also cover the area beyond the platform, minimum 1 - 1.5 m' from the edges of the platform base.

The bedrock on the north side is considerably eroded imposing the need of rebuilding of the base up to the level of the stone blocks of the platform. The rebuilding and leveling should cautiously be done by use of stone masonry in cement lime mortar (hydraulic mortar is recommended to be used).

The finishing layer of the base, part of the bedrock and part of the rebuilt surface should be made by use of hydraulic mortar with a thickness of 1.5-2 cm upon the entire surface that will be well leveled and smoothed. Over this layer, the stone blocks of the first row of the common platform of the Eagle and Lion statues are placed (Fig1).

### 3.4. Repair and Consolidation of Stone Blocks

Each stone block belonging to the statue and the platform that has previously been identified and marked by a corresponding number is subjected to a treatment involving:

- inspection and cleaning;
- evaluation of damage status (damage level);
- necessary repair, consolidation and preparation for incorporation.

Stone blocks that have undergone failure and whose parts still exist are repaired by connection of those parts. For example, the stone block on the front side of the platform below the Eagle statue (Photo5, Fig 3.) is repaired by incorporation of stainless steel wedges or carbon fiber reinforcement and their fixation with fluid epoxy resin with slow catalizer (Araldite Hy. 554 or equivalent) and making of contact upon the entire surface by an epoxy type of glue with previous consent and cooperation of stone conservation specialists.

Smaller parts of the blocks are directly glued, whereas mechanical pins are used for larger ones.

The stone blocks with missing parts (whose parts cannot be found or identified) are in situ evaluated as to whether it is necessary that they be repaired by adding of a new stone block or not. If the importance of the stone block is such that it requires that it be complete and repaired from structural reasons, a new part is added. Otherwise, the stone block is left as found.

In case of a missing block within the entire structure, evaluation is made as to its role for the structural stability. In case this stone block has an important role for the structural stability, a new one made of the same material and of the same form is incorporated and it is marked by, for example "NDP 2003". In case the missing stone block has not such an importance, a new one is not incorporated into the structure.

### 3.5. Rebuilding of the Base of the Eagle and Lion Statues

It should be noted that the base of the two statues represents a single structure composed of large stone blocks with a rectangular plan (Fig 1 ).

The repaired and cleaned stone blocks are placed on the prepared base according to their original position and the corresponding numeration. The placement of the stone blocks is precisely done by use of special tools and equipment that cannot cause any damage. The interior of the base is filled with dry stone masonry blocks with a finishing smoothing layer of hydraulic mortar with thickness of 1.5 to 2 cm. The interior should be built on with stone plates not with fine stones.

### 3.6. Rebuilding of the Eagle Statue

The stone blocks of the Eagle statue have been identified and all the elements are on the terrain. After treating of each stone block, rebuilding should start on a previously prepared base.

The stone masonry of the statue, from the base to the eagle's head (rows of stone blocks, Fig 3) are placed with full contact through horizontal connection by use of hydraulic mortar or lead. The application of mortar or lead is not over the whole supporting surface but should enable full contact between the upper and the lower stone blocks. The dry masonry system should remain authentic.

After the treatment of masonry up to the planned level, preparations are made for the re-erection of the eagle's head. Previous treatment of the eagle's head should involve formation of a flat surface for contact, stone conservation treatment and placement of wedges for connection of the statue's head with the lower part.

Six wedges made of stainless steel are placed into previously drilled holes on the lower part of the eagle's head and are poured with epoxies. On the lower part of the statue, holes for the steel wedges are made in the contact surface. After trying the holes and other preparation of the contact surface, the holes are poured with epoxies and the head is lowered onto the contact surface.

### 3.7. Rebuilding of the Lion's Head

The condition of the stone blocks constituting the lion statue is much worse. There are missing stone blocks or crushed blocks that lie on the platform and the east terrace.

After complete identification of the stone blocks and treatment of all the stone blocks involving repair and shaping, it is important to get an insight into the exact position of the missing stones. The missing stone blocks that cannot be identified as original but are of importance for the stability of the structure will have to be replaced by new hewn stone blocks of identical shape marked with the date of their incorporation "Nemrud Dağ Project 2003". Considering that the entire inventory of stone blocks is not available at the moment, there remains that a decision on each stone (treatment before incorporation into the structure) be made in the course of reconstruction. The procedure and the mode of performance of the works is the same as those for the Eagle statue. The lion's head has undergone more extensive damage than the eagle's one wherefore its stone conservation treatment should be more detailed. In the process of its conservation, it should be repaired and a flat surface with incorporated 6 stainless steel bars (Fig 3) should be created as in the case of the Eagle's head.

## 4. METHODS AND TECHNIQUES FOR CONSERVATION (Removal, Transportation and Placement of Stone Blocks)



The methods and techniques of reconstruction are the subject of detailed studies and projects, but in this phase of the project, discussed as a proposal could be a simplified method that enables preservation of authenticity and avoiding of damages to the stone blocks, particularly those bearing inscriptions, decorations, etc.

Care should be taken to respect, to the maximum extent, the original mode of building and arrangement of the stone blocks, without mortar, concrete or similar materials and each individual stone should undergo a stone conservation treatment.

New techniques and materials that are easy to be performed in situ (wedges, connections, stainless steel, carbon with epoxies and alike) should be used for repair of the broken stone blocks and their connection, if justified from structural aspects.

The cranes to be used should be light weight and mobile.

## 5. CONCLUSION AND RECOMMENDATION

Based on analysis of the structure and its seismic stability given in the annex to this report, it can be concluded that the reconstruction of the north platform with the Eagle and the Lion statues on the east terrace satisfies the safety and stability criteria for the designed mode of performance and incorporated elements for connection of the heads of the statues with the lower parts of the stone structure.

It is recommended that reconstruction be performed by professionals, in close cooperation with archaeologists and stone conservators.

## APPENDIX: STRUCTURAL ANALYSIS OF EAGLE STATUE

### GEOMETRICAL CHARACTERISTICS OF THE STATUE

Fig. A-1 shows the geometrical characteristics of the eagle statue. The data have been taken during the survey carried out in the course of June/July 2002 and can be treated preliminary. This particularly refers to layers 1 - 5 given in Fig. A-2 containing also other data (area A, inertial moment  $J_i$ , resistance moment  $W_i$  etc.)

### STATIC AND DYNAMIC ANALYSIS OF EAGLE STRUCTURE

Gravity load:

- The structural system can be considered as a rigid system composed of blocks and horizontal joints (Fig. A-1)
- Five layers of stone blocks should be taken into account considering the rigid body.
- On the basis of the geometrical characteristics of the statue and the blocks as well as the properties of the limestone, the weight of the blocks is:

- Block 5	$W_5 = 1.70 \text{ t}$
- Block 4	$W_4 = 3.80 \text{ t}$
- Block 3	$W_3 = 4.1 \text{ t}$
- Block 2	$W_2 = 4.1 \text{ t}$
- Block 1	$W_1 = 5.90 \text{ t}$

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Total weight:  $\sum_1^5 W = 19.60 \text{ t}$

Axial forces and stresses in corresponding layers are:

Layer 5:  $N_5 = 1.70 \text{ t}$   $\sigma_{oc} = 0.24 \text{ kg/cm}^2$  /  
compression

Layer 4:  $N_4 = 5.50 \text{ t}$   $\sigma_{oc} = 0.16 \text{ kg/cm}^2$  /  
compression

Layer 3:  $N_3 = 9.60 \text{ t}$   $\sigma_{oc} = 0.40 \text{ kg/cm}^2$  /  
compression

Layer 2:  $N_2 = 13.70 \text{ t}$   $\sigma_{oc} = 0.60 \text{ kg/cm}^2$  /  
compression

Layer 1:  $N_1 = 19.6 \text{ t}$   $\sigma_{oc} = 0.47 \text{ kg/cm}^2$  /  
compression

The axial stresses are very low in correlation with the capacity of limestone  $\sigma \geq 30 \text{ kg/cm}^2$ .

## ANALYSIS OF STRUCTURE FOR SEISMIC ACTION

The seismic action is defined by the Turkish Seismic Code of 1996. The structure is located in the highest zone I, with ground acceleration of  $A_0 = 0.40 \text{ g}$  (for a return period of 500 years)

According to seismic criteria, two levels of behaviour will be controlled:

- (I) For  $A_0 = 0.40 \text{ g}$  - the behaviour of the structure should be in the elastic range without damage (ductility factor - factor of structural behaviour  $q = 1.0$ )
- (ii) For the maximum possible expected acceleration of  $A_0 = 0.60 \text{ g}$ , some damage and disturbance of the structure will be accepted but the global stability should be preserved without collapse, overturning or heavier damage.

Analysis will be performed using equivalent seismic forces for a lump mass system of a rigid body and the finite element method using the SAP 2002 computer programme.

## ANALYSIS OF STRUCTURE FOR THE FIRST LEVEL OF SEISMIC ACTION $A_0 = 0.40 \text{ g}$

- Seismic forces in the base of the structure

$$\sum F = \frac{A_0 \cdot I_0 \cdot W}{q};$$

$$A_0 = 0.40 \text{ g}$$

$I_0$  = importance factor

$q$  = behaviour factor

$$\sum F = \frac{0.40 \cdot 1.10 \cdot W}{1.0};$$

$A = 0.40$  - acceleration

$I = 1.1$  - importance factor

$q = 1.0$  - elastic behaviour

$$\Sigma F = 0.40 \cdot 1.1 \cdot 19.60 = 8.60 \text{ t}$$

Distribution of seismic forces over the height of the structure:

$$F_i = \sum F_i \frac{W_i \cdot h_i}{\sum W_i \cdot h_i} ;$$

Wi = weight of the block

hi = height

Fi = seismic force at  
i-th level

$$\sum W_i h_i = 32.4$$

$$F_5 = 8.60 \frac{1.70 \cdot 3.7}{\sum W_i \cdot h_i} = 1.65t$$

$$F_4 = 8.60 \frac{3.80 \cdot 2.8}{32.4} = 2.80t$$

$$F_3 = 8.60 \frac{4.10 \cdot 2.0}{32.4} = 2.20t$$

$$F_2 = 8.60 \frac{4.10 \cdot 1.2}{32.4} = 1.30t$$

$$F_1 = 8.60 \frac{5.90 \cdot 0.4}{32.4} = 0.65t$$

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$$\sum F = 8.60t$$

Moment from equivalent seismic forces in corresponding layers:

$$\text{Layer 5: } M_{s5} = 1.65 \times 0.60 = 1.0 \text{ tm}$$

$$\text{Layer 4: } M_{s4} = 1.65 \times 1.40 + 2.8 \cdot 0.4 = 3.43 \text{ tm}$$

$$\text{Layer 3: } M_{s3} = 3.43 + (1.65 + 2.8) \cdot 0.8 + 2.20 \cdot 0.4 = 6.80 \text{ tm}$$

$$\text{Layer 2: } M_{s2} = 6.80 + (1.65 + 2.8 + 2.20) \cdot 0.8 + 1.30 \cdot 0.4 = 11.62 \text{ tm}$$

$$\text{Layer 1: } M_{s1} = 11.62 + (1.65 + 2.8 + 2.2 + 1.3) \cdot 0.8 + 0.65 \cdot 0.4 = 18.20 \text{ tm.}$$

Control of stresses and overturning in corresponding layers

Layer 5

$$N_G = 1.70 \text{ t}$$

$$N_s = 1.0 \text{ tm}$$

$$\sigma_0 = \frac{N}{F} = \frac{1700}{7100} = 0.24 \text{ kg/cm}^2 < \sigma_{AW}$$

$$\sigma_s = \frac{M}{W} = \frac{1.0}{0.084} = 11.90 \text{ t/m}^2 = 1.20 \text{ kg/cm}^2$$

$$\sigma_1 = 0.24 + 1.20 = 1.44 \text{ kg/cm}^2 - \text{compression}$$

$$\sigma_2 = 0.24 - 1.20 = 0.96 \text{ kg/cm}^2 - \text{tension}$$

$$\text{Overturning: } n = \frac{M_s}{M_G} \leq 1.0$$

$$n = \frac{1.0}{1.70 \cdot 0.475} = 1.25 > 1.0$$

Overturning should be prevented bgy stainless steel pints:

Tension force:

$$T = \frac{\sigma_t \cdot A_t \cdot L_t}{2}$$

$$T = \frac{9.6 \cdot 0.29 \cdot 0.39}{2} = 0.50t$$

$$A_{st} = \frac{T}{\sigma_y} = \frac{500}{2100} = 0.23cm^2$$

6φ 12 mm' bars should be constructed in layer 5

Layer 4:

$$M = 3.43 \text{ tm}$$

$$N_G = 5.50 \text{ t}$$

$$\sigma_o = 0.16 \text{ kg/cm}^2$$

$$\sigma_s = 0.48 \text{ kg/cm}^2, \sigma_{\max} = 0.65 \text{ kg/cm}^2 \sigma_t = 0.32 \text{ kg/cm}^2$$


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Overturning:  $n = \frac{3.43}{5.50 \cdot 1.10} = 0.56 \leq 1.0$

The stresses are very low and the overturning criterion is satisfied

Layer 3

$$M = 6.80 \text{ tm}$$

$$N = 9.60 \text{ t}$$

$$\sigma_o = 0.40 \text{ kg/cm}^2 \quad \sigma_{\max} = 1.35 \text{ kg/cm}^2 \text{ compression}$$

$$\sigma_s = 0.48 \text{ kg/cm}^2 \quad \sigma_t = 0.55 \text{ kg/cm}^2 \text{ tension}$$


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Overturning:  $n = \frac{6.80}{9.60 \cdot 1.10} = 0.64 < 1.0$

Layer 2

$$M = 11.62 \text{ tm}$$

$$N = 13.70 \text{ t}$$

$$\sigma_o = 0.60 \text{ kg/cm}^2 \quad \sigma_{\max} = 2.52 \text{ kg/cm}^2 \text{ compression}$$

$$\sigma_s = 1.92 \text{ kg/cm}^2, \sigma_m = 1.32 \text{ kg/cm}^2 \text{ tension}$$


---

Overturning:  $n = \frac{11.62}{13.7 \cdot 1.1} = 0.77 < 1.0$

Layer 1

$$M = 18.20 \text{ tm}$$

$$N = 19.6 \text{ t}$$

$$\sigma_o = 0.47 \text{ kg/cm}^2$$

$$\sigma_s = 2.0 \text{ kg/cm}^2$$

$$\sigma_{\max} = 2.47 \text{ kg/cm}^2 \text{ compression}$$

$$\sigma_m = -1.5 \text{ kg/cm}^2 \text{ tension}$$

$$\text{Overturning: } n = \frac{18.20}{19.6 \cdot 1.10} = 0.844 < 1.0$$

The stresses are low, while the overturning is satisfied.

It can be concluded that the structure satisfies the seismic stability criteria

#### ANALYSIS OF STRUCTURE FOR THE SECOND LEVEL OF SEISMIC ACTION $A_o = 0.60g$

This level corresponds to the maximum expected acceleration with a return period of over a thousand of years. This level should be used for controlling the structure against failure. The main criterion for this type of structures is overturning.

The equivalent seismic force can be defined as follows:

$$\sum F_i = \frac{A_o \cdot I \cdot W}{q}$$

$$A_o = 0.60 \text{ g}$$

$$I = 1.20$$

$$q = 1.50$$

$$W = \text{weight of the}$$

structure

$$\sum F_i = \frac{0.60 \cdot 1.20 \cdot 19.60}{1.50} = 9.45t \quad k_i = \frac{9.45}{8.60} = 1.10$$

Control of overturning per connections:

$$\text{Layer 4: } n = \frac{3.43 \cdot 1.10}{5.50} = 0.68 < 1.0$$

$$\text{Layer 3: } n = \frac{6.80 \cdot 1.10}{9.60} = 0.77 < 1.0$$

$$\text{Layer 2: } n = \frac{11.62 \cdot 1.10}{13.70} = 0.93 < 1.0$$

$$\text{Layer 1: } n = \frac{18.2 \cdot 1.10}{19.60} = 1.01 \approx 1.0$$

The global stability is satisfied

Fig A –1. Schematic model for static and dynamic analysis  
Part 2- Finat Element Analysis

Emergency measures on the statue of Antiochos (statue C) (prepared by P. Gavrilovic)

The Antiochos statue is in an extraordinarily critical condition from the aspect of stability. Large displacements by vertical joints along a line might cause progressive collapse of the statue resulting from a minor micro tremor or other kind of unexpected load.

Considering the conditions of this statue, it was put in the priority list in 2001. During the activities carried out in 2002, the statue was shored up from the inside by timber props, but this is not sufficient enough. The proposal for an intervention involving incorporation of ties at several heights around the statue was not accepted in 2002 and as a result, the statue was only shored up (see also the description of the situation in of the statue in attachment 1).

Wanting to point out the seriousness of the problem, we propose two alternatives for emergency intervention:

- (i) The shoring up should be improved and ties should be incorporated to prevent disintegration of the statue. Ties could be used at three places along the height. These could be made of steel or other material (a non destructive, reversible method).
- (ii) The second alternative could be dismantling by hoisting of the upper layers of the stone statue, displacement and closing of the lower stone blocks and leaving the statue in such condition until final solution for its consolidation and reconstruction is made.

Preparation of the restoration of the lion and eagle at the south side (statue A and B)

Given the present condition of the colossal statues on this part of the terrace it is impossible to well prepare the restoration of statue A and B as many blocks are buried under gravel that has come from the tumulus or under other blocks.

We are therefore planning to dismantle the rubble of blocks at the south side of the East Terrace and to put the blocks temporarily on the terrace. There they will be documented and studied.

During our next campaign it will then be possible to stabilise the underground and base of the lion and eagle statue and to restore them.





present condition of the colossal statues on the south side of the East Terrace

Prepare the restoration of Kommagene (statue D)

On advise of P. Pagnin and other stone experts we will glue the quickly deteriorating shoulder pieces of statue D (Kommagene) to prevent further deterioration.

**For the 2003 campaign both, the sandstone reliefs/elements as well as (parts of) the colossal statues, will be tested with non destructive methods by a team from Prof. Dr. Fitzner as described in our proposal for the 2002 campaign.**

**For the 2003 campaign a documentation of the site and the ongoing protection and restoration activities by means of film/video is planned.**

**It is likely that parts of both the terraces will temporarily have to be closed for the public during the protection and restoration activities.**

### ATTACHMENT 3 CV and list of publications of Brijder/Moormann/Versluys

#### Curriculum vitae of Prof. Dr. H.A.G. BRIJDER

Born: on 21-1-1945 in Amsterdam.

Study: Master's degree (*cum laude*) in Classical Archaeology and History of Ancient Art, University of Amsterdam, on 3-9-1973.

PhD Classical Archaeology (*cum laude*): *Siana Cups I and Komast Cups*, University of Amsterdam, 14-12-1982.

Professor of Classical Archaeology and History of Ancient Art, since 1-9-1986.

Head of the Department of Classical Archaeology and History of Ancient Art, University of Amsterdam, since 1-9-1986.

Director of the Allard Pierson Museum, The Archaeological Museum of the University of Amsterdam, from 1986 to 2001

Editor-in-chief / publisher of the *Allard Pierson Series*, since 1979.

13 volumes in the *Allard Pierson Series*, 5 in the *Scripta Minora*, 1 in *Collections of the Allard Pierson Museum*, and 1 CVA.

Main publications:

*Siana Cups I and Komast Cups*, Amsterdam 1983.

*Siana Cups II: The Heidelberg Painter*, Amsterdam 1991.

*Corpus Vasorum Antiquorum, Allard Pierson Museum, Amsterdam*, fasc. 2, Amsterdam 1996.

*Siana Cups III: The Red-black Painter and Griffin-bird Painter and Siana Cups resembling Lip-cups*, Amsterdam 2000.

Fieldwork:

Excavations of the Casa del Protiro in Ostia, Italy: campaigns in 1973, 1974, 1975.

Director of the excavations at Satricum, Italy: since 1990.

Director of the international Nemrud Dağ project: since 2001

President of the Organizing Committee of the *Symposion on Ancient Greek and Related Pottery, Amsterdam, 11-15 April, 1984*; editor of the proceedings.

President of the *International Congress of Classical Archaeology, Amsterdam, 12-17 July, 1998*.

Korrespondierendes Mitglied des Deutschen Archäologischen Instituts, since 1992.

Secretary of the Allard Pierson Stichting

Member of the Senaat of the Universiteit van Amsterdam, 1999-2002

Head of the Committee of Classical Antiquity of the Dutch Institute at Rome.

Member of the CVA Committee of Royal Dutch Academy of Sciences.

Scientific senior advisor Allard Pierson Museum, sinds 2001

Member of the board Stichting Nederlands Studiecencentrum voor Latium

Member of the board Vereniging van Vrienden van het Allard Pierson Museum

Editor *Satricum-Serie*

Editor *Mededelingenblad Vereniging van Vrienden Allard Pierson Museum*

### List of Publications

#### **1973**

- (1) 'Een Attische Dierfriesschaal in het Allard Pierson Museum', *Mededelingenblad Amsterdam* 7, 6-8.

#### **1974**

- (2) 'Black-Figure Cups in Amsterdam', *BABesch* 49, 105-16.

#### **1975**

- (3) 'Attic Black-Figure Cups in Amsterdam and an Exchange with Heidelberg', *BABesch* 50,2, 157-77.  
(4) 'Nolan Amphora by the Sabouroff Painter', *BABesch* 50,1, 30-32 (with J.M. Hemelrijk).  
(5) 'Column Krater probably near the Alkimachos Painter', *BABesch* 50,1, 32-34 (with J.M. Hemelrijk).  
(6) 'Villanova en Etrurië in Amsterdam', *Mededelingenblad Amsterdam* 10, 1-8.  
(7) Review O. Von Vacano, *Zur Entstehung und Deutung gemalter seitenansichtiger Kopfbilder auf Schwarz-figurigen Vasen der griechischen Festlandes*, Bonn, in *BABesch* 50, 292-93.

#### **1976**

- (8) (ed.) *Selected Pieces, Allard Pierson Museum Amsterdam*, Alkmaar : 135 pp.  
(9) *Selected Pieces* (see 8) 54, 62, 68-72, 76, 108-20, 128.  
(10) (ed.) *Griekse, Etruskische en Romeinse Kunst, Allard Pierson Museum Amsterdam*, Culemborg: 187 pp.  
(11) *Griekse, Etruskische en Romeinse Kunst* (see 10): 'De Etrusken', pp. 86-114; 'De Romeinen', pp. 115-150 (with M.L.E. Schuurman).  
(12) 'Vijf votiefgeschenken in bruikleen', *Mededelingenblad Amsterdam* 11, 7-8.

#### **1977**

- (13) 'A Bronze Ankle-Guard and Belt in Amsterdam', *Festoën, Festschrift A.N. Zadoks-Josephus Jitta*, Groningen-Bussum, 187-194 (with a contribution by H.E. Frenkel).  
(14) *De Etrusken*, een syllabus, Amsterdam : 71 pp.

#### **1978**

- (15) 'Twee nieuwe sfinxen in het Allard Pierson Museum', *Mededelingenblad Amsterdam* 16, 1-3.  
(16) (ed.) *Een Romeins Huis in Amsterdam*, Amsterdam : 126 pp.  
(17) 'Een Romeins Huis', *Hermeneus* 50,2, 131-132.

#### **1979**

- (18) 'Beazley and the Shape of Siana Cups', *Schriften des Deutschen Archäologen-Verbandes IV, Bericht vom Symposion des Deutschen Archäologen-Verbandes, 'Vasenforschung nach Beazley'*, Tübingen, 24.-26. 11. 1978, Mainz, 15-17.

#### **1981**

- (19) Review C.B. Boulter and K.T. Luckner, *CVA The Toledo Museum* (1976) in *Mnemosyne* 34, 1-2, 199-201.

## 1982

- (20) (ed.) *Hoe klassiek is Amsterdam, Classicisme en Klassieke Vormtaal in de Amsterdamse Bouwkunst*, Alkmaar: 87 pp.
- (21) 'Hoe Klassiek is Amsterdam, Klassieke Vormen in Amsterdamse Gebouwen', *Hermeneus* 54,3, 190-200.
- (22) *Siana Cups I and Komast Cups* (diss. Universiteit van Amsterdam). Text: 494 pp.; Plates: 108 pp.; total: 602 pp.

## 1983

- (23) 'A Komast Cup', *Occasional Papers on Antiquities, 1: Greek Vases In the J. Paul Getty Museum*, Vol. 1, 1-8 (with P.J. Connor, Melbourne).
- (24) *Siana Cups I and Komast Cups, Allard Pierson Series*, Amsterdam, Vol. 4; diss. 1982. Text: 316 pp.; Plates: 104 pp.: total 420 pp.

## 1984

- (25) (ed.) *Proceedings of the International Symposium, 'Ancient Greek and Related Pottery', Allard Pierson Series*, Amsterdam, Vol. 5: 344 pp.
- (26) 'Changing The Subject: Evidence on Siana Cups', *Proceedings Symposium Amsterdam* (see 25) 248-251.
- (27) (ed.) *Griekse, Etruskische en Romeinse Kunst, Allard Pierson Museum*, Alkmaar; revised ed. 1976: 207 pp.
- (28) *Griekse, Etruskische en Romeinse Kunst* (see 27), 32-33, 105-109, 112, 142.
- (29) 'Two Etruscan Centaurs?', *BABesch* 59,2, 54-59.
- (30) 'Een Etruskische kantharos', *Mededelingenblad Amsterdam* 32, 2-5 (with S. Telling).
- (31) 'Bronzen sieraden van een Etruskische dame uit Veii, zevende eeuw v. Chr.', *Mededelingenblad Amsterdam* 32, 6-8 (with R. van Beek).
- (32) 'Een helm en een paar enkelbeschermers, vijfde eeuw v. Chr.', *Mededelingenblad Amsterdam* 32, 9-13.
- (33) 'Een Etruskische bronzen spiegel uit het eind van de vierde eeuw v. Chr., Parisoordeel òf ontmoeting van Paris en Helena?', *Mededelingenblad* 32, 16-20 (with J.T. Smit-Lub).

## 1985

- (34) 'The Paintings in the House of the Porch' in J.S. Boersma et al., *Amoenissima Civitas. Block V.ii at Ostia: description and analysis of its visible remains*, Assen, 271-280.
- (35) 'The Sculpture of the House of the Porch' in J.S. Boersma et al., *Amoenissima Civitas* (see 34) 280-291.
- (36) 'Een bikonische asurn', *Mededelingenblad Amsterdam* 33, 1-5.
- (37) 'Realistisch of geïdealiseerd? Een Romeins vrouwepoortret uit de Tiberische tijd', *Lampas* 18,1, 77-96.
- (38) 'Een Etruskische jongeman en een Romeinse vrouw: twee soorten portretten', *Mededelingenblad Amsterdam* 35, 1-9.
- (39) 'Vier vroeg-Etruskische voorwerpen', *Mededelingenblad Amsterdam* 35, 16-20.

## 1986

- (40) 'War and Peace on a New Siana Cup by the Ainipylos Painter', *Mythologie und Vasen-malerei, Festschrift K. Schauenburg*, Mainz, 21-28.
- (41) 'A Pre-Dramatic Performance of a Satyr Chorus by the Heidelberg Painter', in *Enthousiasmos, Essays on Greek and Related Pottery presented to J.M. Hemelrijk, Allard Pierson Series*, Amsterdam, Vol. 6, 69-82.
- (42) (ed.), with A.A. Drukker, C.W. Neeft, *Enthousiasmos Essays on Greek and Related Pottery presented to J.M. Hemelrijk, Allard Pierson Series*, Amsterdam, Vol. 6: 220 pp.
- (43) (ed. and some chapters), *Rijk en Hemels Aardewerk, Mededelingenblad Amsterdam* 37-38: 32 pp.
- (44) *Apen op het toneel?, Ikonologische interpretatie van voorstellingen op Griekse vazen uit de zesde eeuw v. Chr.*, inaugural lecture, Universiteit van Amsterdam: 20 pp.

## 1987

- (45) 'Groen Pompeii: illusie en werkelijkheid', *Lampas* 20,1, 85-98.
- (46) 'Voetenbankje voor een Etruskische dame', *Mededelingenblad Amsterdam* 39, 14-18.

- (47) 'An Etruscan Terracotta Footstool from the Fifth Century B.C. in Amsterdam', *BABesch* 62, 67-74.

#### 1988

- (48) 'Op één been kan men niet lopen', *Mededelingenblad Amsterdam* 43, 27-30.  
(49) 'Politieke motieven in de Griekse kunst uit de 6de en 5de eeuw voor Chr.', *Spiegel Historiael* 23, 7/8, 331-335 (with J. Beelen).  
(50) 'The Shapes of Etruscan Bronze Kantharoi from the Seventh Century B.C. and the Earliest Attic Black-figure Kantharoi', *BABesch* 63, 103-114.

#### 1989

- (51) *De Etrusken* (with J. Beelen, L.B. van der Meer), exhib. cat. Allard Pierson Museum, 28 Oct. 1989 - 25 Febr. 1990, Den Haag: 220 pp.  
(52) 'Thesan, de Etruskische godin van het morgenrood', *Mededelingenblad Amsterdam* 45, 12-17 (with P.S. Lulof).  
(53) 'De Etrusken in Amsterdam', *Hermeneus* 61, 271-73.

#### 1990

- (54) *De Etrusken* (with J. Beelen, L.B. van der Meer), 2nd rev. ed.

#### 1991

- (55) 'A Band-cup by the Phrynos Painter in Amsterdam', *Stips Votiva, Papers presented to C.M. Stibbe*, M. Gnade (ed.), Amsterdam, 21-30.  
(56) 'Zes zwijnen op een rij', *Mededelingenblad Amsterdam* 50, 7-9.  
(57) 'Een dame uit Canosa', *Mededelingenblad Amsterdam* 51, 3-9.  
(58) Review R.S.P. Beekes and L.B. van der Meer, *De Etrusken spreken*, in *Hermeneus* 63, 222-23.  
(59) *Siana Cups II: The Heidelberg Painter, Allard Pierson Series*, Amsterdam, Vol. 8. Text: 208, pp. Plates: 79 pp.

#### 1993

- (60) 'Simple decorated, black Siana Cups by the Taras Painter and Cassel Cups', *BABesch* 68, 129-145.  
(61) 'Een goudgele steelpan', *Mededelingenblad Amsterdam* 56, 9-12.  
(62) 'Medousa onthoofd', *Mededelingenblad Amsterdam* 58, 3-6.  
(63) 'De Amsterdamse kouros', *Mededelingenblad Amsterdam* 58, 6-18 (with M.H.J. van Dorst).

#### 1994

- (64) 'Griekse beelden in een Nieuwe Vleugel', *Hermeneus* 66, 24-33.  
(65) 'Griekse marmeren beelden in de Nieuwe Vleugel', *Mededelingenblad Amsterdam* 59/60, 1-3.  
(66) 'Het ontstaan van de monumentale Griekse beeldhouwkunst', *Mededelingenblad Amsterdam* 59/60, 16-22.  
(67) 'Marmer in Beeld', *Spiegel Historiael* (March/April) 104-105.  
(68) 'Marmer in Beeld' in het Allard Pierson Museum, *Scarabee* 9, 28-32.

#### 1995

- (69) 'The Amsterdam Kouros', *Pharos* III, 3-21 (with M.H.J. van Dorst).  
(70) 'Allard Pierson Museum: verzamelen, aankopen en vervalsen' in *Jaarboek van de Universiteit van Amsterdam: Collecties*, Amsterdam, 28-34.  
(71) 'Attische drinkschalen: interpretatie van voorstellingen', *ibid.*, 36-39.  
(72) 'An Attic Black-figure Siana Cup by the Malibu Painter' in *Greek Vases in the San Antonio Museum of Art* (H.A. Shapiro and C.A. Picon eds., San Antonio) 74-75 no. 32.  
(73) 'An Attic Black-figure Siana Cup in the Manner of the Heidelberg Painter' in *ibid.* 75-77 no. 33.  
(74) 'An Attic Droop Cup by the Painter of Athens NM 21028' in *ibid.*, 98 no. 46.  
(75) 'An Attic Black-figure Cup by the Group of the Camiros Palmettes', in *ibid.*, 102 no. 49.

#### 1996

- (76) *Corpus Vasorum Antiquorum, Amsterdam* 2, The Netherlands 8, in collaboration with P. Heesen, J.T. Smit-Lub, O.E. Borgers (Amsterdam): 224 pp.  
(77) ed., P. Heesen, *The J.L. Theodor Collection of Attic Black-Figure Vases: Allard Pierson Series*, Amsterdam, Vol. 10: 210 pp.

- (78) 'Komast Cup and Siana Cups', in P. Heesen, *ibid.*, 101-123.
- (79) 'The C Painter', in *The Dictionary of Art*, Vol. 32 (London) 37.
- (80) 'The Heidelberg Painter', in *ibid.*, 47.
- (81) 'Tleson', in *ibid.*, 69.
- (82) 'Feestelijk en smaakvol drinkgerei', *Mededelingenblad Amsterdam* 65, 2-12.
- (83) 'De vele gezichten van Dionysos', *Mededelingenblad Amsterdam* 66-67, 28-31.
- (84) 'Herakles, een onverschrokken held', *Mededelingenblad Amsterdam* 66-67, 32-33.
- (85) "'Mooi versierd" toont prachtig Atheens aardewerk', *Scarabee* 25, 4-8.

#### **1997**

- (86) 'New Light on the Earliest Attic Black-Figure Drinking-Cups', in: J.H. Oakley, W.D.E. Coulson, O. Palagia (eds.) in *Athenian Potters and Painters, The Conference Proceedings* (Oxford) 1-15.
- (87) 'A Bronze Cup in the Allard Pierson Museum', *BABesch* 72, 21-35 (with C.M. Stibbe; contribution by R. Leenheer).
- (88) 'De gevolgen van het Unidroit-verdrag voor een archeologisch museum', in *Unidroit-verdrag, wel of niet in Nederland?, Internationale bescherming van cultureel erfgoed* (Amsterdam) 26-30.

#### **1998**

- (89) 'Geschenken voor de Griekse afdeling', *Mededelingenblad Amsterdam* 71, 2-6.
- (90) 'Veelkleurige Bruidsgeschenken uit Centuripe', *Mededelingenblad Amsterdam* 71, 9-14.
- (91) 'Drinkschalen uit Athene. De verzameling van Dr. J.L. Theodor', *Klassieke collecties in Nederland en België, Oudheid te kijk, Imago Kalender*, no. 6.

#### **2000**

- (92) *Siana Cups III, The Red-black Painter, Griffin-bird Painter and Siana Cups resembling Lip-cups, Allard Pierson Series*, Amsterdam, Vol. 13. Text: 241 pp. Plates: 103 pp.
- (93) 'Placca di Schnabelkanne con haruspice', in *Gli Etruschi, Catalogo della mostra, Palazzo Grassi, Venezia* (Venice), 592.
- (94) 'Hydria ceretana del Pittore dell'Aquila', in *ibid.*, 594.
- (95) 'Anfora del Pittore di Amsterdam', in *ibid.*, 607.
- (96) 'Kantharos', in *ibid.*, 610.
- (97) 'Een Etruskische prachtschaal', *Mededelingenblad Amsterdam* 79, 7-9.
- (98) 'Een veelkleurig eierschaaltje uit Apulië', *Mededelingenblad Amsterdam* 79, 16-17.
- (99) 'Een Etrusco-Romeins tempelmodel', *Mededelingenblad Amsterdam* 79, 18-21.

#### **2002**

- (100) 'Greece' in, *A Guide to the Collections of the Allard Pierson Museum Amsterdam* (Amsterdam), 102-139.
- (101) 'Southern Italy and Sicily' in *ibid.*, 142-53.
- (102) Editor, with G. Jurriaans-Helle, *A Guide to the Collections of the Allard Pierson Museum Amsterdam* (Amsterdam) 223 pp.
- (103) 'The Study of Attic Black-figure Vases over the Past Thirty Years', in *Proceedings of the International Vase Symposion, Griechische Keramik im kulturellen Kontext, Kiel 24-28 September 2001* (Kiel), 1-9.

### **Curriculum Vitae of Prof. Dr. Eric M. MOORMANN**

Born 9 January 1955 in Boxmeer, The Netherlands

MA Classics, Classical Archaeology and Italian Literature, Nijmegen University, 21-5-1980

PhD Classical Archaeology, Nijmegen University, 26-9-1986



University Docent Classical Archaeology, University of Amsterdam, as of 1-5-1987

Archaeologist and interim director Dutch Institute in Rome 1-9-1992 – 1-2-1997

Visiting Professor University of Bologna, Italy 1-1-1997 – 1-7-1997

Interim Director Dutch Institute in Athens 15-4-2000 – 15-10-2001

Professor of Classical Archaeology at the University of Nijmegen, as of 1-3-2002

Since 1997 Korrespondierendes Mitglied des Deutschen Archäologischen Instituts

#### Excavation and fieldwork practice

Excavations at Agrigento (Sicily) 1978; Dutch excavations at Nijmegen, Alphen, Zwammerdam 1974-1978; Fieldwork in Pompeii, Herculaneum and Rome from 1979 onwards in various projects.

#### Main fields of research

Greek and Roman sculpture; urbanistics of Pompeii and Rome, Roman wall painting; Fortune of Antiquity in western European culture

#### List of Publications

##### **1980**

E.M. Moormann/P. Beelen/T. Verhoeven, *Pis fhefhaked eisei Suodalicium*, Nijmegen 1980.

##### **1981**

W.J.Th. Peters/L.J.F. Swinkels/E.M. Moormann, Die Wandmalereien der römischen Villa von Druten und die Frage der Felderdekoration in den europäischen Provinzen, *Berichten van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 28 (1978) 153-197.

##### **1982**

Roman Wall-Paintings from the Netherlands: A Survey, in J. Liversidge (ed.), *Roman Provincial Wall-Painting of the Western Empire*, B.A.R. Int. Series 140 (1982) 161-182.

E.M. Moormann/L.J.F. Swinkels, Wall-Painting Fragments from Roman Villas at Stein and Ravensbosch, *Berichten van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 29 (1979) 403-424.

##### **1983**

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## 2001

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## 2002

(with M.J. Versluys) The Nemrud Dağ Project: first interim report, *Bulletin Antieke Beschaving* 77 (2002)

## Curriculum Vitae of Dr. M.J. VERSLUYS

Born: 29-9-1971

MA Classical archaeology, University of Leiden 1995

PhD research at the University of Leiden 1996-2001

Doctoral degree (cum laude): 10-5-2001 'Aegyptiaca Romana. Aspects of a cultural phenomenon'

Post doctoral research fellow Amsterdam Archaeological Centre

## Lecturer in Hellenistic and Roman Archaeology at Leiden University

Excavation and fieldwork practice in Holland and Belgium (Houten, Alphen aan den Rijn, Treignes) and around the Mediterranean (Italy: Fregellae, Pompeii, Rome; Greece: Halos).

### List of Publications

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#### **1999**

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#### **2000**

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#### **2001**

*Aegyptiaca Romana. Aspects of a cultural phenomenon* (diss. Leiden)

Review of: S. Muth, *Erleben von Raum – Leben im Raum. Zur Funktion mythologischer Mosaikbilder in der römisch-kaiserzeitlichen Wohnarchitektur* (1998), *Bulletin Antieke Beschaving* 76 (2001) 219-220

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#### **2002**

*Aegyptiaca Romana. Nilotic Scenes and the Roman Views of Egypt* (2002) (Brill-Leiden/Boston, Religions in the Graeco-Roman World 144, 509 pp.)

Splendid Isolation? A glimpse into contemporary British archaeology, *Archaeological Dialogues* 8.2 (2002) 104-108

(with E.M. Moormann) The Nemrud Dağ Project: first interim report, *Bulletin Antieke Beschaving* 77 (2002)



#### Attachment 4

#### Team List 2002

Prof. Dr. Herman A.G. **Brijder** Projectmanager  
see attachment 3

Prof. Dr. Eric M. **Moormann** Projectmanager  
see attachment 3

Dr. Miguel J. **Versluys** Assistant Acting Project Manager  
See attachment 3

Ir Maurice L.A. **Crijns** Project Co-ordinator

#### C.V.

1966-1972	HBS/Gymnasium
1972-1977	Technical University of Eindhoven / architecture
1977-1987	Senior Architect ZON
1987-1990	Comm.Director Rolscreen Company Inc.
1990-1996	Research & Development Director Alumax Inc.
from 1996 onwards	Managing Director Ems-NI BV

#### List of Publications

*Generation of Small Ions*, University of Utrecht / Physics

*The impact of airborne ions on human physiology* - co-author Dr. Ir. Hoelscher; report M/75/4, Laboratory for Materials / Technical University Eindhoven, 1975.

*Ultrasonic detecting structural integrity of building constructions and human bone fractures* - co-author Dr. Ir. Hoelscher; report M/76/4, Technical University Eindhoven, 1976.

*Wood, woodframe construction and green roof*, Department of Housing, Municipality of Rotterdam, jan.1981.

*Measurements on ion contents in hospitals*, co-authors Dr. T.F. de Bruin (Institute of Meteorology and Oceanography, University of Utrecht), Dr. An Wakeren (Institute KEMA), Dr. Beganovic (Dept. Prematures of the Hospital of St.Joseph Eindhoven 1986), 1-7.

*Kommagene : das vergessene Königreich*, Istanbul, 1987.

Prof. Dr. Predrag **Gavrilovic** Civil Engineer

#### C.V.

1963	MA Institute of Earthquake Engineering and Engineering Seismology, Skopje, Republic of Macedonia, M. Sc. in Earthquake Engineering
1973	PhD Civil Engineering Faculty, University of Belgrade, Doctor of Technical Sciences in Structural engineering
1969-1974	Assistant Professor, Faculty of Civil Engineering University Ciril and Metodius ,Skopje
1974- 1982	Associate Professor, IZIIS, Skopje
1982- 1991	Professor and Head of Structural Department at the Institute,IZIIS,Skopje
1991- now	Professor, Principal Investigator and Research Advisor ,IZIIS ,Skopje; Professor on Post Graduate study and International School on following subjects: Seismic Design of Building Structures. Reinforced Concrete Structures. Repair and Strengthening of Structures; Principal Investigator of a number of National and International Projects; Visiting Professor and lecturer of different Universities (Belgrade,

Italy-Bologna, Algeria CGS, Podgorica , Phnom Penh and other);  
 Director of International Council of Seismic Design of Structures;  
 UNESCO and UNDP expert and consultant in different projects; The  
 Getty Conservation Institute (GCI) and World Monument Fund  
 (WMF) New York consultant.

❑ List of Selected International Research Projects /1991-2001/  
 (Principal investigator and/or Co-principal investigator/

- "Dynamic Analysis of Wooden Truss - Frame Structures", YU-USA Research joint project 1988-1992
- "Methods for Ripar and Strengthening the National Monuments in Pagan-Burma"  
 ,UNESCO/UNDP project , 1991/92
- "Investigation for Elaboration of Seismotectonic Map and Draft Seismic Design Code of Tunisia",  
 Skopje - Tunis, UNESCO Project,1991-1992
- "Study for Seismic Strengthening, Conservation and Restoration of Churches Dating from  
 Byzantine Period (9<sup>th</sup> - 14<sup>th</sup> Century) Located in Macedonia", The Getty Conservation Institute-  
 IZIIS joint project, 1991-1994
- "Structural Stabilization of Monuments at Preah Khan - Historic City of Angkor, Cambodia",  
 (Principal investigator and Author of Methodology for Structural Aspects), World Monuments  
 Fund, New York, USA, 1993-2000.
- "Shaking Table testing of Adobe Structures", USA-MK joint project The Getty Conservation-  
 IZIIS, 1995-1996
- "Development of Metrology for Ultra Strength Concrete" , Ministry of Science of  
 Macedonia,1996-2000
- "Development of Methodology for Repair of Historical Monoamines " MOSM ,1998-2001

Publications (1991-2001)

- . "International Hand Book of Earthquake Engineering"(Codes,Programs and  
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#### **Ir Jaap Groot**

Civil engineer

##### C.V.

1956-1962	Gymnasium HBS Hilversum
1962-1966	HTS Utrecht
1966-1974	Consultant South Africa
1974-1980	Technical University Eindhoven
as of 1980	Consultant worldwide.

#### **Christoph Kronewirth**

Conservator/Restorator

##### C.V.

Christoph Kronewirth (Trier) was trained as a restorator and stone expert on many sites around the Mediterranean. He worked for 20 years with the German Archaeological Institute in sites like, for instance, Pergamon on the reconstruction of the temple of Trajan. In Didyma he works as a collaborator to Prof. Dr. O. Bingöl.

#### **Dr. Paolo Pagnin**

Stone conservator

##### C.V.

Since 1983	Conservator/Restorer, Venice, Italy
1985	U.N.E.S.C.O. Course on "Preservation and Treatment of Stone",
1988	I.C.C.R.O.M "Conservation of Mural Paintings", Rome, Italy.
Since 1987	Assistant/Coordinator, I.C.C.R.O.M. Course on the "Preservation and Treatment of Stone", Venice, Italy.

- 1991/92/93 I.C.C.R.O.M and UNESCO Consultant , on the U.N.E.S.C.O./U.N.D.P. Conservation Project regarding the restoration of the Nampaya Temple, Pagan (Burma).
- 1993/94 'Ecole Française d'Extreme Orient'' Consultant, on the conservation of the Khmer Temple "Presat Phanom Wan" at Korat (Thailand).
- 1996 / 1997 World Monuments Fund Consultant, on the Conservation Project concerning the "Preah Khan" Temple , Angkor Tom (Cambodia)  
U.N.E.S.C.O. Consultant , on the Development Project of the Agra and Matura Area (India) concerning the conservation of the region's most important monuments including the Taj Mahal.  
U.N.E.S.C.O.consultant for the conservation of the frescoes of the Probota Monastery Romania
- 1999 W.M.F Consultant on the Conservation Project concerning Constantin Brancusi's Monumental Complex, Targu Ju, (Romania ).

Most important projects undertaken

- 1983/4/ Restoration of three stone monuments inside the church of Frari XV / XVI century
- 1985 Restoration of the Scala del Bovolo, Venice, Italy XV century.
- 1988 Restoration of the mai portal of the church of Etampes, France XII century.
- 1989 Restoration of the frescoes in the Church of Angelo Raffaele, Venice, Italy XVIII cent.
- 1990 Restoration of the Renaissance facade of the Doges Palace Venice, Italy, XVI century.
- 1991 Restoration of sculpture west facade of Bourges Cathedral, France XII century.
- 1992 Restoration of the facade of the church Sainte Croix, Bordeaux , France XII century.
- 1993 Restoration of the archeological fountain Del Pincio, Rome, Italy.
- 1994 Restoration of some fountains, Château of Villandry, France, XVIII century.
- 1995 Restoration of the towers of the Catedral of Notre Dame, Paris, France.
- 1996 Consolidation of the tree portals of the cathedral of Nantes, France.
- 1997 Restoration of the facade of the church of S. Maria Formosa, Venice, XVI century.
- 1997 Restoration of the facade of Villa Medici, Rome, Italy XV century.
- 1998 Restoration of the frescoes of the church Incoronata, Mantova, Italy XVII century.
- 1999 Restoration of the main portal of the Cathedral of Amiens, XIV century.
- 2000 Restoration of the palace Ca'Pesaro, Venice, XV century.
- 2001 Restoration of the facade of the church S. Maurizio, Venice, XVIII century.

**Marlies Schipperheijn**

Epigraphist

C.V.

- 1990-1996 Highschool, G.S.G.D. Doetinchem
- 1996-1997 Propaedeutics Dutch language and Literature, RUG Groningen
- 1997-2001 Greek and Latin, RUG Groningen, Major Ancient History.

**Drs. Tesse D. Stek**

Classical Archaeologist

C.V.

- 1990-1996 Gymnasium Amsterdam
- 1996-2001 Classical Archaeology, University of Amsterdam
- 2001-2005 PhD research at the University of Amsterdam

**Anne Ten Brink**

Pre-Historian

C.V.

- 1980-1988 Highschool docent

1982-1986	Pre-history Assen
1988-1993	Interim-Management
as of 1993	Director Coa

Drs. Ellen **Thiermann** Classical Archaeologist  
C.V.

1982-1995	Gymnasium Berlin
1996-2000	Prehistory and Classical Archaeology, University of Freiburg and Berlin
1998-1999	Student stipend, University of Rome
2000-2002	Masters, University of Amsterdam

Prof. Dr. Onno M. **Van Nijf** Epigraphist  
C.V.

June 2000-to date	Van der Leeuw Full Professor of Ancient History University Of Groningen
July 1998-June 2000	Royal Dutch Academy Postdoctoral Research Fellow. Research project: The festive culture of the Greek City in the Hellenistic Roman Periods. University of Amsterdam/Faculty of Classics Cambridge.
Sept.1997-July 1998	Leverhulme Research Fellow in Greek epigraphy Faculty of Classics, Cambridge.
Oct.1995 – Sept.1997	Teaching fellow in Ancient History. Dept. of Classics and Ancient History, University of Bristol.
1991-1995	Junior Research Fellow in Ancient History. Faculty of Arts, University of Amsterdam.
March 1996	PhD. (with distinction). Dissertation: The Civic World of Professional Associations in the Greek Cities of the Roman Empire. University of Amsterdam
1987-1990	Postgraduate study Ancient History Faculty of Classics, Cambridge
1980-1988	Study Classics University of Leiden

#### List of books published

Trade, Transport and Society in the Ancient World. A sourcebook. (with F.Meijer) London, 1992. (Routledge).  
 The civic world of private associations in the Greek East. Amsterdam, 1997. (J.C.Gieben).

Dr. Eberhard **Wendler** Stone Scientist  
C.V.

Dr. Wendler studied Chemistry at the University of Munich, Germany, where he obtained his PhD in Solid State Chemistry (development of artificial bone for implantation materials). He was Scientific Researcher at the Bavarian State Conservation Office and Chairman of the Stone Conservation Working Group at Geological Institute of the University of Munich. Since 1992 he has established a private Conservation Laboratory, continuing research in the field of stone conservation while serving as consultant in both national and international projects on Stone and Brick Conservation (Brazil, Norway, Finland, France, Eastern Europe,

India, Thailand, Cambodia, Easter Island/Chile). He has published extensively in the field.

Bernd **Fitzner**, Dr.-Ing.

Stone scientist

C.V.

Dr. Fitzner studied geology in Aachen and Vienna. He is currently Academic Director of the Geological Institute of the RWTH (Rheinisch Westfallisch Technische Hochschule) Aachen, Germany, and Chairman of the Working Group “Natural Stones and Weathering”.

He has participated in numerous national and international research projects dealing with stone deterioration, microstructure analysis, artificial weathering simulation and has published extensively in all of these topics. He is member of several national and international Committees dealing with these topics.

Kurt **Heinrichs**, Dipl.-Geol.

Stone Scientist

C.V.

Dr. Heinrichs has studied Geology at the RWTH Aachen. For the past ten years he has been Scientific Researcher in the Working Group “Natural Stones and Weathering” at the Geological Institute. He has collaborated in various national and international research projects dealing with the nature of stone and its deterioration.

Dennis **La Boucharderie**

Stone Scientist

Drs. J.M.F. **Diederén**

Cineast

C.V.

1989 MA History

from 1990 Research, production, and direction of many documentaries for Dutch television, thereby mainly focussing on science and scientific projects

Peter A. **De Kock**

Cineast

C.V.

1986 - 1990 Hogeschool Sittard: Photography (graduation 1990; Cum Laude)

1990 - 1994 Filmacademy Amsterdam (NFTVA) Direction : Camera (graduation 1994)

from 1995 Preparation, direction and shooting of many documentary camera- and directing projects

Olga **Boon** Assistant to the Project Co-ordinator

Frits **Steenhuizen** Operator High Resolution Scanner

Participating student-assistents from the universities of Amsterdam and Nijmegen:

Drs. Jurriaan **Venneman** (UvA)

Louis **van den Hengel** (KUN)

Celine **Rouvroye** (KUN)