

Comité scientifique international pour la pierre
International Scientific Committee for Stone

Minutes of the meetings held in Lisbon, Portugal
on 11-12 February 2005
Organised by Jose Delgado Rodrigues, ICOMOS Portugal

Next ISCS meetings :

- Xian (China): during the ICOMOS general assembly, 17-21 october 2005
- Marseille (France): 25-26 november 2005

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Report

Participants :

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Véronique Vergès-Belmin	VVB	LRMH, Champs-sur-Marne	FR
Wolfgang Krumbein	WKN	ICMN, Oldenburg	GE

Excused persons: Andrew **McMillan** , Daniel **Kwiatkowski** , David **Young** , Elena **Charola** , Esther **Leisen** , Francis **Tourneur** , Hans **Leisen** , Ingval **Maxwell** , Jean-Marc **Vallet** , JoAnn **Cassar** José María **García de Miguel**, Kati **Winterhalter** , Marisa **Laurenzi Tabasso** , Per **Storemyr** , Philippe **Bromblet** , Rob **Van Hees** , Rolf **Snethlage**, Tadateru **Nishiura** , Tamara **Anson-Cartwright** , Thomas **Warsheid**.

1. FRIDAY FEBRUARY 11, 09.00-17.00

1.1. General discussion

Elsa Bourguignon accepts to bear the task of secretary for the meeting.

Presentation of Laboratorio Nacional da Engenharia Civil (LNEC) by Jose Delgado-Rodrigues.

Presentation of Mrs **Michoinova**, new voting member, representing Czech republic. Mrs Michoinova is engineer in chemistry, and specialized in characterization of traditional plasters and renders.

Tsunami:

Bern Fitzner was in southern India (Madras) and in Birma during that period. Although the direct consequences of flooding were dramatic (loss of human lives, housing etc.), Monuments were more or less safe: problems could be observed more specifically in little villages. He did not get any information for Burma and Sri Lanka. Nobody seems to know exactly what happened there. In Thailand no real problems were noticed on stone monuments. The question is raised on whether the ICOMOS ISCS could provide some help there. It is finally considered that members can help as individual experts on special issues. A special letter will be prepared by IPF to be sent to the concerned national committees.

Course on stone conservation:

As required during the previous meeting, **IPF** informs the group that ICCROM decided to revise in a global manner the content of the courses on architectural conservation, including the course of Venice. After a first evaluation by a private office, a special report has been asked to John Fidler, from English Heritage and member of ICCROM council. The conclusions of this report propose to reorganize the technical courses around a central core on architectural conservation that will be held in Rome. Working groups on the various technical courses (stone, mural paintings, wood) will be gathered by ICCROM during 2005 to build a new structure, in order to allow the re-opening of the courses in 2006. IPF proposed to the Council to involve the members of ISCS in the work on the Venice course, and the proposal was accepted.

JDR: it is a good new, but the situation is different now, with the projects of European standards, the existence of technical courses on stone conservation in different countries, etc. He strongly supports the technical courses with a straight selection for students and teachers. It is possible to imagine different levels (teaching of teachers).

SSN thinks that technical problems have not to be put in the corner. The same at the national level.

EB emphasizes the international role of ICCROM that adds a special value to the contents of the training courses

IPF asks to the group its official position, and eventually volunteers to participate in the preparatory work for ICCROM : the group will support the new course, and DK, VVB, JDR are suggested to be especially involved in the evaluation of the future drafts. The discussion is focused on the needs of practical courses.

Diffusion of the glossary:

IPF informs the group that a printed publication would be appreciated by the president of ICOMOS, Michael Petzet

MKR agrees on that idea, with an introduction on the group and the work already done.

JDR thinks that it is possible to find arrangements with public organisations for the funding.

SSN mentions the example of German publications. He wonders what is the best way to diffuse the glossary, by selling it or by an other mean?

Other issues

MKR: as suggested in Stockholm, she proposes that in every meeting general information would be given on the stone conservation situation in each country. In Sweden after the Stockholm congress (June 2004), problems appeared: why to use chemicals on façades? There was a fight on stone conservation approach, and a return on traditional techniques and replacement of stone materials. Is there an international position on this topic? Is it useful to have an official position of the group?

SSN: it is a social problem with different local situations: Poland or England is different

JDR: it is difficult to argue on this theme and to have a common position. He underlines the importance of standards and the role of ISCS in this topic.

CFN: it is a philosophical question but also an economical one. In the field of concrete the situation is more or less the same. It could be useful to share information's about the situation in each country (involved in ISCS activities...) and to write a summary for Sweden colleagues.

SSN: it is not possible to give recommendations but a general discussion on the topic could be organized among the group. Concrete conservation in USA is more and more important. What is the efficiency of consolidation techniques ? The problème is growing.

JDR : knows countries that have encountered problems on concrete. We cannot ignore the economic and social problems, but it is not possible to ignore the progress in knowledge on stone conservation for 20 years

BFR mentions also laterite problems that have emerged in his group.

JDR gives a general information on EuArtech program.

SSN thinks that this program is very interesting because the ion beam facilities in Germany are closed for conservation problems. Congratulations

WKN : feels a will to reactivate the research on cultural heritage. But there is a problem in Germany with the Ministry in charge of the Environment that doesn't want to continue to work on cultural heritage. It would be necessary to connect economy with cultural heritage and to involve natural stone industry

Work on the glossary

Since the last meeting, all the data related to the glossaries (background ones, and ISCS) have been included into a PHP data base, especially conceived, which facilitates greatly the process of entering and modifying data. At the moment the « new look » of the glossary pages is not available on the net.

The group is split into 4 working groups :

WG1 : MKR, IPF, SSN

WG2 : MVM, JDR, BFR

WG3 : DMA, CFN, EBN,

WG4 : WKN, MKR, VVB

2. SATURDAY FEBRUARY 12, 09.00-14.00

Administrative points

- **Location of the next meeting**

Foreseen places:

Edinburgh: not possible at fall 2005. (info from Ingval Maxwell, collected after the meeting)

Xian: proposed by MKR. Many ICOMOS members will join. An occasion to get colleagues from Asia, and to provide info on the group activity to the ICOMOS community. Negative prospects from people from Europe to be able to attend the meeting.

Aachen: not possible at the moment according to BFR

Berlin: proposed by SSN, who has moved recently from USA (Getty Conservation Institute) to The Rathgen Institute in Berlin. Not for the next meeting but possibly at the end of 2006.

Marseille: proposed by VVB and Ingval Maxwell during a phone discussion after the meeting. Jean-Marc Vallet, the foreseen organiser (CICRP), would be happy to organise a meeting focused on the glossary issue, by the second half of november 2006

At the time when this report is written, the decision on the place of the meeting is set up after a long period of exchanges. There will be two meetings at fall 2006:

- a meeting in Xian with a limited number of participants from Europe, where the activity of the group would be presented to the ICOMOS colleagues, and specially to members of other scientific committees,
 - persons being sure to attend:* SSN, Rolf Snethlage, Jose Garcia de Miguel, MKR, VVB, Vasu Saowalux
 - persons who may attend:* EBN, Nishiura Tadaretu, Daniel Kiatkowsky, Tamara Anson Cartwright, Dagmar Michoinova
- a meeting in Marseille, where a number of European colleagues would join, and concentrate on the correction of the glossary in English, so that next step (translations) could begin
 - persons being sure to attend:* Philippe Bromblet, Jean-Marc Vallet, IPF, VVB, Per Storemyr, Vahagn Israelyan, MVM, Andrew Mc Millan, Rob Van Hees
 - persons who may attend:* EBN, Elisa Heikkila, Joan Cassar, Kati Winterhalter, Jose Garcia de Miguel, CFN, Marisa Tabasso

- **Preparation for the election of a new board**

IPF informs the group that no official application was received before the meeting. Only a written proposal by **Rolf Snethlage** who suggested to nominate Inval Maxwell as a president, and Stefan Simon as a secretary. **Stefan Simon** does not apply for the position, nor **Ingval Maxwell**, who, contacted after the meeting considered that the present team was more appropriate for completing the ongoing work.

MKR: stability of the group is needed at the moment. She proposes to keep the present team.

IPF indicates that she is really very busy and occupied by her charge of LRMH director. She was really happy to renew the stone committee with the active collaboration of VVB. She considers that the real work is done by VVB and suggests to elect her as a president, to keep Mr Nishiura as a vice-president, and to find a new general secretary already involved in the project of the glossary. In this way the continuity is ensured without a fundamental change in the team. She will continue to follow the scientific work and to support technically and financially the project.

Mr Nishiura, asked by e-mail before the meeting accepts to keep the charge of vice-president with three conditions:

1. Most members consider the position of vice president to be from Asian country.
2. Most members expect a meeting and site tour in Asia in the next three years.
3. Ms Tamara A. Cartwright agrees to this matter, because he remembers that he asked her to be next vice president at the meeting in France three years ago.

Within a general discussion it is considered that the 2 first conditions are fulfilled. For the third one, the question is asked to TAC after the meeting, and she answered that she considers positively the proposal to present herself as a vice president for next three years. An e-mail exchange after the meeting with TAC confirms her will to be candidate for the position of vice president.

Nevertheless, considering that the quorum of voting members is not reached (13/23), the vote is postponed after the meeting by an e-mail procedure, that will be organized by the president and the general secretary, as soon as possible.

Work on the glossary

The group is split into several working groups (WGs)

WG1: MKR, IPF, SSN

WG2:
WG3:
WG4: WKN, VVB

Elaboration of a letter for the tsunami

The content of the draft prepared by **IPF** is discussed and finally approved by the group. The text is enclosed in the present report.

3. CONCLUSIONS

The output of the work performed may be found in annex 2. VVB shall make an overview the definitions and will present comments and suggestion at the next meetings.

ANNEX 1
ICOMOS –ISCS
MEMBERS LISTS

ICOMOS - International Scientific Committee for Stone

ICOMOS - International Scientific Committee for Stone

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ANNEX 2

ISCS glossary

Elaboration of definitions
State of the art Lisbon/February 2005

General terms

Alteration /lisbwg2

Definition	Any modification in the intrinsic stone properties.
Relationship with the substrate	
Synonym(s)	
Other orthograph	
Sub-type(s)	Alteration (in geological sense) - any modification in the intrinsic rock properties that took place under endogenic conditions; Weathering – any chemical or mechanical modification in the intrinsic stone properties that occur under the influence of exogenic factors.
Not to be confused with	
Other remarks	
References	The group recommends that a good textbook be consulted to find the currently adopted definitions

Weathering /libwg2

Definition	<p>The destructive processes by which rock material upon exposure to atmospheric conditions changes colour, texture, firmness, or form, with little or no transport of the loosened or altered material. Biological changes are included in the process. If immediate transport of the loosened material is included the term erosion is to be applied.</p> <p>The action of the elements on a rock in altering its color, texture, or composition, or in rounding off its edges. the natural chemical or physical alteration of an object or deposit through time.</p> <p>Any of the chemical or mechanical processes by which rocks exposed to the weather undergo changes in character and break down.</p>
Relationship with the substrate	
Synonym(s)	
Other orthograph	
Sub-type(s)	
Not to be confused with	
Other remarks	.
References	<p>www.hyperdictionary.com</p> <p>The American Heritage® Dictionary of the English Language: Fourth Edition. 2000</p>

Decay /lisbwg2

Definition	any chemical or mechanical modification in the intrinsic stone properties leading to a loss of value or to the impairment of usefulness.
Relationship with the substrate	
Synonym(s)	
Other orthograph	
Sub-type(s)	Damage (stone) - human perception of the loss of value due to decay
Not to be confused with	
Other remarks	.
References	www.hyperdictionary.com The American Heritage® Dictionary of the English Language: Fourth Edition. 2000

Degradation lisbwg2

Definition	A decline in the decay state to a lower condition, quality, or level
Relationship with the substrate	
Synonym(s)	
Other orthograph	
Sub-type(s)	
Not to be confused with	
Other remarks	.
References	The American Heritage® Dictionary of the English Language: Fourth Edition. 2000

Biological colonization

Alga /lisbwg4

Definition

An Alga (Algae as plural form) is a microorganism involved in biological weathering. Algae can be seen out doors and indoors, as powdery or viscous deposits (thickness : tens of mm to several mm). They form green, red, brown, or black veil-like zones and can be found mainly on situations, where the substrate remains moist for extended periods of time. On monuments, algae constitute unicellular to multicellular clusters. The size of individual rock dwelling algae varies between several micrometer and several mm.

Relationship with the substrate

Depending on the environmental conditions and the substrate algae may form solid layers or smooth films falling down upon drying. When penetrating deeper into the substrate they may be very difficult to recognize. In cases the rock serves as a source of nutrients. However usually the rock surface is only a solid holdfast for growth.

Synonym(s)

Other orthograph

Sub-type(s)

Several groups of algae may grow on and in rocks depending on climate and rock type. Green algae (usually green) diatoms (usually yellow to brown), and in rare cases red algae may occur. Prokaryotic cyanobacteria (formerly called blue-green algae) are very frequent rock settlers and can cause black, bluish or even violet stains. Trentepohlia e.g. is a green algae despite its red colour.

References QUB: Queen University, Belfast
www.qub.ac.uk/geog/documents/research/weathering/weathering%20features.htm

Biofilm /lisbwg4

Definition Type of biological colonization in a very thin layer. Mono-to multilayered microbial community attached to surfaces with varying thickness of up to 2mm.

Relationship with the substrate

If the biofilm penetrates into the rock substrate it becomes a network or biocliton. Subaerial biofilms represent a maximum of cell material living at a minimum of water available. Often a biofilm consists of very few cells of different microorganisms embedded in large amounts of extracellular slime. These cohesive often sticky layers may shrink and expand according to the supply of water. Further like flypaper biofilms may extract and absorb nutrients from the atmosphere.

Synonym(s)

Other orthograph

Sub-type(s) Biofilms often create multicoloured biopatina by pigment and mineral production. Multilayered biofilms or several consecutive generations of biofilm growth may createlaminated multilayered crusts on many rocks by trapping materials in the slime or generating biomineral deposits. These can be regarded as rock skins, sinter crusts or microstromatolites

Not to be confused with soiling, staining, encrustation, patina

Other remarks

References

Biological Colonisation / lisbwg4

Definition	Biological colonisation relates mainly to plants and micro-organisms as bacteria, cyanobacteria, algae, fungi and lichen (symbioses of the latter three). It also includes influences by other organisms such as animals settling on and in rock
Relationship with the substrate	Direct growth on and in rock or rock cavities; also indirect influences by nearby trees and other organisms
Synonym(s)	"Biological colonization is preferred to "biological growth", "biological overgrowth", "living exogenous material"
Other orthograph	Biological colonization
Sub-type(s)	Colonisation and changes of the substrate may be produced by various microorganisms, plants, trees, insects, other animals including birds
Not to be confused with	Deposit,
Other remarks	Organisms often colonise rock surfaces and available cavities, cracks and/or pore space. Plants are immediately recognizable but micro-organisms are often hard to distinguish from deposits because of their being living matter and because of their characteristics (e.g. appearance, colour). Higher plants grow sometimes to a considerable size at unexpected places of buildings. Organic debris and excretions of plants and trees may largely influence the wear down process of nearby buildings. Several groups of insects are known to create deep holes. Cf. Biofilm, biokarst
References	MDDS

Biological growth /lisbwg4

Both higher plants and minute biological organisms can thrive in masonry, the first immediately recognizable and the latter to be distinguished among the deposits (cf. category deposit, to which they also belong) because of their being living matter and because of their characteristics (e.g. appearance, color..). Higher plants can grow in already deteriorated masonry. See also under deposit: living exogenous material.

Mould lisbwg4

Definition a mould is a microscopic fungus (micromycete) .Growth of mould may reach dimensions visible macroscopically as a film or network or star-like patches of filaments outgrowing from a center with diameters between 2 and 10mm.

Relationship with the substrate

Mould by their filamentous and/or yeast like growth may penetrate several cm into the rock substrate especially when scavenging for water. They also may extract nutrients from the rock minerals.

Synonym(s) fungi

Other orthograph other orthograph: Mold

Sub-type(s) Many genera of mould can be found on rock. The most conspicuous and perhaps detrimental are the black yeast-like fungi formerly called *Dematiaceae*.

Not to be confused with

Algal and cyanobacterial growth as well as initial stages of lichen and surficial fruiting bodies of endolithic lichen especially when dry can be confused with mould. It is especially difficult to differentiate between inorganic manganese dendrites and dendritic mould on rock

Other remarks

Mould often create serious damage by chemical and mechanical action and heavy discoloration. Mould is also a health risk by production and excretion of allergens and other compounds. Mould does not only grow on organic substrates. It occurs on and in many rock types. As the metabolisms of mould necessitates organic substrates mould often develops on algal metabolic products. However, resistant mould growth was found on desert rocks without algae and mould growth increases considerably in big cities. In this case organic pollution of the atmosphere favours mould growth.

References

Krumbein, W. E. and Gorbushina, A. A., 1996. Organic pollution and rock decay. p. 277-284 in: Pancella, R. (ed.): Preservation and restoration of cultural heritage. Proceedings of the 1995 LPC Congress. EPFL, Lausanne, 773p.

Moss /lisbwg4

Definition	Moss is a bryophyte often growing on rock and in fissures, usually at permanently or frequently wet and shadowy places
Relationship with the substrate	Mosses develop rhizines and may create a micro-soil zone between rock surface and moss
Synonym(s)	
Other orthograph	plural form: mosses
Sub-type(s)	
Not to be confused with	Lichen, some algal or cyanobacterial growth forms
Other remarks	Mosses, like biofilms often change morphology and colour appearance under lack or excess of water (shrinking and expanding considerably); when eliminated mosses usually have produced less destruction traces than some lichen, fungi and bacteria
References	

Lichen lisbwg4

Definition

All lichen represent symbiotic growth of a fungus and an alga or a cyanobacterium. Lichen often consist of a thallus showing no differentiation into stem, root and leaf.

Relationship with the substrate

Occurs as crusty patches or bushy growth on stone.

Synonym(s)

Other orthograph

Sub-type(s)

Lichen usually are divided into crustose, folious and xxx epilithic types.

When their thallus is mainly inside the rock, they are called endolithic lichen.

An important subdivision especially for lichen is made according to the rock type they grow on. Calcicole lichen grown on limestone and marble silicole lichen on sandstone and e.g. granite .

Not to be confused with

Mosses, algal and fungal biofilms

Other remarks

Lichens grow generally on external parts of the building and have a leathery appearance; they are usually orange, green, grey or black.

Lichen is a common feature of stonework and is generally best developed under clean air conditions, but growth may be facilitated by certain pollutants such as nitrogen oxides derived primarily from vehicle pollution. Views on their significance vary. Some consider that they help to chemically weather the underlying stone and to physically damage the stone by plucking out grains as they dry out. Others point out that lichens require a stable substrate and take a lichen cover to indicate surface stability. Perhaps it is best to treat each building as an individual case when trying to assess the impact of a lichen cover. Former lichen growth may be detected by typical biopitting structures or lobate or mosaic patterns and even depressions.

References

QUB (Queen University of Belfast)

MDDS

Detachment

Chipping proposed to be suppressed / LisbWG1

Definition	The result of an accidental or man-made action . The physical breaking off of pieces of sound material to produce chips that disfigures an original surface. The chips are irregular in form and thickness and vary in size. A deterioration evidenced by the total or partial detachment of parts (chips or splinters) often following discontinuity planes in the original material
Relationship with the substrate	It may affect the surface of the substrate or can occur in depth
Synonym(s)	
Other orthograph	
Sub-type(s)	
Not to be confused with	Flaking, Splintering
Other remarks	The formation of chips is often attributed to the presence of salts crystallizations or micro-organisms, clay minerals may be present. *
References	

* NOT COHERENT WITH MAN MADE DETERIORATION PATTERN

Contour scaling LisbWG1

Definition	Contour scaling should be placed under "scaling"? Detachment of stone into a scale or a stack of scales . The interface with the sound part of the stone is parallel to the carved surface of the stone. This kind of detachment is independant from any stone structure. As it is a kind of scale, its thickness (few mm to 5 cm) is negligible compared to its extension. Contour Scale WG2 A physical separation of a veneer, or planes of common thickness, parallel to the worked outer surface of a stone that is independent of the stone's natural structure. Different stones can produce veneers of different thickness (from 1mm up to 25mm). <i>It mainly appears on worked stones.</i>
Relationship with the substrate	the detachment has got a subplanar shape, which develops below the stone surface.
Synonym(s)	Case hardening
Other orthograph	
Sub-type(s)	
Not to be confused with	Delamination, exfoliation, flaking
Other remarks	It mainly affects carved stones. The detachment plane, in contour scaling, is often considered as an evaporation limit . It is generally linked to salts crystallization and /or hygric dilatation. Can be due to subcutaneous growing of micro organisms (W. Krumbein)
References	Fitzner

Exfoliation /lisbwg3

Definition	Detachment of multiple stone layers following any stone structure (bedding, banding, etc.), sub-parallel to the stone surface.
Relationship with the substrate	
Synonym(s)	"delamination" is a synonym of "exfoliation"
Older orthograph	
Sub-type(s)	
Not to be confused with	Scaling which is independant of the stone structure Spalling which affects bricks or more generally manufactured products.
Other remarks	<i>Concerning exfoliation the thickness of the detaching stone elements is applied as intensity criterion</i> This feature corresponds to the evaporation limit which is in the stone. It can be due to salts crystallization, expansion and contraction of trapped moisture, chemical action like rusting of metal.
References	Normal , Grimmer

Fragmentation /lisbwg3

Definition	The complete disintegration or partial breaking up, into smaller portions or chips of variable dimensions that are irregular in form, thickness and volume, often following discontinuity planes in the original material
Relationship with the substrate	It may affect the surface of the substrate or can occur in depth
Synonym(s)	
Other orthograph	
Sub-type(s)	
Not to be confused with	Flaking Chipping which is the result of an accidental or man-made action.
Other remarks	Fragmentation is often attributed to the presence of discontinuity planes in the material, which can allow for salt crystallization, microbiological growth, clay dilatation, freeze/thawing action.
References	

Scaling /lisbWG3

Illustrations: Picture 1: Crop the bottom of the picture showing alveolar erosion. Add as a first picture showing a very clear example of large scale scaling.

Definition	Detachment of stone layers not following any stone structure and parallel to the stone surface. Exfoliation can occur only close to the stone surface
Relationship with the substrate	It occurs from the surface to the depth, below the surface.
Synonym(s)	scale is the term adopted in the case one has to describe exclusively the feature, and not the process of scaling The terms "plaque" or "plaquette" and "desquamation" are synonyms which should not be used. The term "layering" which refers to layering (more than one layer) of material with an originally laminated structure, should not be used either. Contour scaling
Older orthograph	
Sub-type(s)	Flaking is local scaling, area does not exceed a few centimeters squares. single scale, multiple scales.
Not to be confused with	Exfoliation which follows the stone structure
Other remarks	
References	VDI, QUB, <i>ICOMOSGP80</i>

Spalling Lisbwg3

Definition	A partial progressive sudden fracturing and detachment of fragments from the exposed stone surface (e.g. as a result of thermal shock or internal pressures from iron rust expansion).
Relationship with the substrate	
Synonym(s)	
Older orthograph	
Sub-type(s)	
Not to be confused with	
Other remarks	.
References	American Heritage® Dictionary of the English Language www.hyperdictionary.com

Splintering /lisb WG3

Definition	See "Fragmentation"
Relationship with the substrate	
Synonym(s)	
Older orthograph	
Sub-type(s)	
Not to be confused with	
Other remarks	
References	

Splitting/lisbWG1

Definition	multiple subdivision of a block through subparallel cracks not parallel to the surface
Relationship with the substrate	
Synonym(s)	
Other orthograph	
Sub-type(s)	
Not to be confused with	exfoliation
Other remarks	Fracture of a stone usually along planes of weakness
References	

Splintering/lisbWG3

Definition	See "Fragmentation"
Relationship with the substrate	
Synonym(s)	
Older orthograph	
Sub-type(s)	
Not to be confused with	
Other remarks	
References	

Staining /lisbwg1

Definition	Staining is a local change in aspect of the surface resulting from accidental and localized discolouration.
Relationship with the substrate	Changes the aspect, but not the physical properties of the substrate
Synonym(s)	
Other orthograph	
Sub-type(s)	
Not to be confused with	Discolouration: which is not localized change in appearance. Specific types of biological colonization may be interpreted as stains in certain cases, when a close examination is not possible.
Other remarks	In general it is correlated to the presence of exogenous materials, as rust, copper salts, organic substances, bacteria, paint, or from the mobilization of endogenous iron oxides.
References	NORMAL

1. Belgium, Brussels, Parc du Cinquantenaire, 1997. Limestone and marble sculpture, showing brown staining due to iron oxydes developping below an iron rod. LRMH

And where is the nice picture from the CERTOSA, Pavia? (KDC)

Discoloration & deposit

Film/wg1

Definition	A thin covering or coating layer, generally of uniform thickness, usually homogeneous and of organic nature, often translucent,
Relationship with the substrate	A film is generally adhering to but not penetrating into the substrate, possibly influencing properties of the surface (aspect, permeability)
Synonym(s)	this term should be preferred to "pellicle" or "skin"
Other orthograph	
Sub-type(s)	Biological film is a natural matrix of biological colonisation growing on the surface of stone which may also penetrate it in depth as a network (biodyction).. An applied film resulting from a treatment, e.g. paint, water repellent, biocide, sealant, cleaning agents
Not to be confused with	Patina, lime wash
Other remarks	Of natural and artificial origin, a film can lose with ageing its translucency or detach from the substrate
References	American Heritage® Dictionary of the English Language)

1. France, Paris, Opéra Garnier, 1999 :Column of the main façade, covered with a superficial film made of polyvinylacetate. This product, applied during a previous restoration campaign, in this case remains plastic and easily removable from the substrate (a dense limestone from Sampans, France) LRMH
2. France, Saint-Génis-Des-Fontaines (Pyrénées-orientales, 66). Église Saint-Michel, 1994 : Xth century marble lintel, showing a **paint film** constituted of a light brown limewash, DIA00094778 LRMH maybe remove, because lime wash is not considered as FILM building, general discussion of the concept of paint (and possible inclusion in the glossary) is needed (lime wash etc...)
3. Italy, Venice, Piazza San Marco, Logetta del Sansovino, 1999: upper part of a rosso ammonitico baluster showing a yellow-brown **film due** to the presence of an epoxy resin surface treatment which remains as a relict on rain protected areas. LRMH

Gloss/lisbwg1

Definition	Gloss is the perception by an observer of the mirror-like appearance of a surface. This appearance cannot be measured. Only the specific reflectance characteristics of a surface can be measured.
Relationship with the substrate	Gloss may be due to previous polishing (intentional or not), or to the presence of a film (transparent or not), having the property to reflect the light.
Synonym(s)	
Other orthograph	
Sub-type(s)	
Not to be confused with	
Other remarks	"Polished surface" should not be used because it refers to a cause, rather than to a feature.
References	Standards as ISO 2813, ASTM D 523 describe the measurement procedures that correlate with the visual ranking of specular gloss for non-metallic surfaces

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| <p>1. France, Paris, Opéra Garnier, 1999 : Marble column of the main façade (type: "Fleur de Pêcher), covered with a superficial film of polyvinylacetate. This product was applied during a previous restoration campaign, to reconstitute the marble's original gloss and deep colours. diameter of the column: ca. 0.7 m. LRMH</p> |
| <p>2. Italy, Venice, Rialto Bridge, 1995 : The glossy aspect of this parapet is due to the repeated rubbing action of people leaning over the bridge. LRMH</p> |
| <p>3. France, Versailles, Castle Park, marble sculpture, 2002. The gloss of this pedestal is due to the application of a non diluted water repellent ; the product is looking like a shiny transparent varnish. LRMH</p> |

Patina /lisbwg1

Definition	A superficial modification of the material (perceivable as a discoloration) in general as a result of ageing but not involving an evident deterioration process.
Relationship with the substrate	No visible change in surface properties
Synonym(s)	
Other orthograph	
Sub-type(s)	Discolouration (bleaching, colouration) Staining
Not to be confused with	Film,
Other remarks	Some authors summarize any alteration experienced by a work of art under the concept of patina. But the glossary has preferred to exclude detrimental phenomena. Patina formation may be due to: (i) natural or artificial alteration. Thin homogeneous layers of algae are sometimes addressed as biopatina
References	Please check the reference and add e.g. Brachert Patinabook

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|---|
| <p>1. Czech Republic, one of the sculptures at the Matyas gate at the Prague castle entrance, 2002. This sandstone sculpture shows a iron-rich blackish patina . LRMH</p> |
| <p>2. France, Pyrénées Orientales, Elne, cloître de l'ancienne cathédrale Ste-Eulalie-et-Ste-Julie, 2002. This marble capital shows a brownish patina, the origin of which is not determined. Small side: 0.4 m. LRMH</p> |
| <p>3. Czech Republic, Prague, St.Vitus Cathedral, 2002. The sandstone elements of these buttresses show a variety of colours. Creamy to orange colors correspond to stones more recently set into the masonry. Brown colours are due to the development of an iron-rich patina, as a result of a longer stay in the environmental conditions .stones size: ca 30 x 50 cm. LRMH</p> |

Soiling /lisb wg1

Definition	Deposit of exogenous particles (eg. dust, bird droppings) on the surface changing the appearance without affecting the structure, but with a different degree of adhesion to the substrate.
Relationship with the substrate	The substrate structure, in case of soiling, is not considered as affected
Synonym(s)	
Other orthograph	
Sub-type(s)	
Not to be confused with	Soiling should be distinguished, if possible , from microbiological colonization and crust or encrustation.
Other remarks	With increasing adhesion soiling can result in a crust or encrustation. Distinction is sometimes made between soiling by pollutants from the atmosphere, by particles from running water, and soiling due to direct anthropogenic influences (e.g. heating convection, car exhaust gases).
References	Fitzner/ VDI/MDDS

1. France, Versailles, Castle Park, marble sculpture, 2002. This very particular type of **soiling** is specific of stone surfaces treated with water repellents. Water pathways are limited to narrow stripes, and lead to localized soiling. large side: ca.0.6 m, LRMH
2. France, Reims (Marne, 51). Cathédrale Notre-Dame. Façade occidentale, portail central, statue de la suivante de la Vierge, 1989 : **Soiling** by dust is frequent on sculptures in position sheltered from incident rain.DIA00015627Irmh

Staining /lisbwg1

Definition	Staining is a local change in aspect of the surface resulting from accidental and localized discolouration.
Relationship with the substrate	Changes the aspect, but not the physical properties of the substrate
Synonym(s)	
Other orthograph	
Sub-type(s)	
Not to be confused with	Discolouration: which is not localized change in appearance. Specific types of biological colonization may be interpreted as stains in certain cases, when a close examination is not possible.
Other remarks	In general it is correlated to the presence of exogenous materials, as rust, copper salts, organic substances, bacteria, paint, or from the mobilization of endogenous iron oxides.
References	NORMAL

1. Belgium, Brussels, Parc du Cinquantenaire, 1997. Limestone and marble sculpture, showing brown staining due to iron oxydes developping below an iron rod. LRMH

And where is the nice picture from the CERTOSA, Pavia? (KDC)

Crack & deformation

Crack /lisbwg2

Definition	<p>A crack is an individual fissure, with a macroscopic size, resulted from separation of one part from another</p> <p>Pictures 2, 3 and 6 are good illustrations of fractures. A better picture for crack should be looked for.</p>
Relationship with the substrate	
Synonym(s)	fissure
Other orthograph	
Sub-type(s)	<p>Fracture – a crack that crosses completely the stone piece</p> <p>A "star crack" has the form of a star. N.B.: rusting iron or impact load are possible causes of this type of damage. Other possible causes are pit-like swelling under the surface and shrinkage of clay at drying when brick contains a lump-like inclusion such as a piece of some hard material, i.e. gravel, metal etc.</p> <p>A "hair crack" is a minor crack with width dimension < 1.5 mm</p> <p>A "craquele" also called "crack network" is a network of minor cracks. When present in the substrate salts can crystallise and fill the cracks.</p>
Not to be confused with	"crazing" is not appropriate for stone. This term should be used for describing the development of a crack network on glazed terracotta. Cracks following the stone structure show transitions to splitting
Other remarks	<p>VDI cracking may be due to weathering, flaws in the stone, static problems, by rusting dowels, etc.</p> <p>GRIMMER A term describing narrow fissures from 1/16 to 1/2 inch width in a block of masonry. Cracking may result from a variety of conditions, such as structural settlement of a building, too hard repointing mortar, or it may be an inherent characteristic of the masonry itself. Small cracks within a single block of masonry may not be serious, but longer and wider cracks extending over a larger area may be indicative of structural problems, and should be monitored.</p>
References	FITZNER VDI MDDS

Deformation :lisbwg2

<p>Definition</p>	<p>MDDS: main heading of a group of damage patterns, exclusively devoted to masonry Fitzner: main weathering form It is restricted to stone slabs only, in particular to those of marble. (Fitzner) Bending/buckling of mainly thin stone slabs due to plastic deformation. Especially on marble slabs (normal) : Change in shape of the element involving warping of the entire thickness of the materials and which mostly affects stone slabs.</p> <p>Change in shape without losing continuity</p> <p>transformation resulting in the variation of distance among any points of the stone element</p> <p>The picture is OK but it needs to be a close-up view. It is difficult to be identified in the actual picture DR can provide one picture</p>
<p>Relationship with the substrate</p>	
<p>Synonym(s)</p>	<p>This term should be preferred to “plastic deformation”</p>
<p>Other orthograph</p>	
<p>Sub-type(s)</p>	
<p>Not to be confused with</p>	
<p>Other remarks</p>	<p>.</p>
<p>References</p>	

Mechanical damage

Abrasion /libwg2

Definition	The process of wearing down or rubbing away by means of friction. We suggest to get pictures from steps of staircases or from grooves made by ancient animal pulled cars. In Pompey there are excellent examples.
Relationship with the substrate	It may appear as a series of scratches
Synonym(s)	
Other orthograph	
Sub-type(s)	
Not to be confused with	Not be confused with erosion. Abrasion is a special type of erosion
Other remarks	Abrasion can be considered as a sub type of erosion
References	American Heritage® Dictionary of the English Language

Cut /libwg2

Definition	Removal of material with edged instrument
Relationship with the substrate	It can have the appearance of an excavated cavity, an incision, a lost edge, etc.
Synonym(s)	incision
Other orthograph	
Sub-type(s)	Tool marks can be considered as a special kind of cut but should not be taken as a damage sign
Not to be confused with	
Other remarks	
References	causing line of division, or void resulting from excavation in the material. N.B.: origin of damage not directly related to environment, in most cases man's action. In restoration artificial joints are sometimes made by scratching/cutting a too long brick. This is done to improve the regularity of the bond pattern.

Perforation :lisbwg2

Definition	Removal of material with a sharp instrument (e.g. by drilling) leaving a void in the form of a hole Good pictures are not difficult to be obtained, particularly for drill holes DR can provide some
Relationship with the substrate	
Synonym(s)	Drill hole
Other orthograph	
Sub-type(s)	
Not to be confused with	
Other remarks	In specific circumstances, marine animals (lithofagus) produce perforations
References	MDDS perforation (origin of damage not directly related to environment; in most cases man's action).

Perforation WG2 /sto

A single or series of surface punctures, holes, rips or gaps that penetrate into the body of the stone. Normally induced manually.

Bursting /lisbwg3

Definition	Local, discreet, loss of the stone surface from internal pressure usually manifesting in the form of an irregularly-sided crater or star-shaped face-fracturing.
Relationship with the substrate	
Synonym(s)	bursting should be preferred to "break out"
Older orthograph	
Sub-type(s)	
Not to be confused with	
Other remarks	Bursting is often due to the increase of volume of mineral inclusions (clays, iron minerals, etc.) naturally contained in the stone near its surface.
References	MDDS

Scratch :lisbwg2

Definition	Superficial and line-like loss of material due to the action of some pointed or sharp object Fitzner can provide good picture
Relationship with the substrate	Usually it appears as a more or less long groove or series of grooves
Synonym(s)	Groove
Other orthograph	
Sub-type(s)	Tool marks can have the appearance of scratches that should not be taken as damage signs
Not to be confused with	cut
Other remarks	
References	MDDS(origin of damage not directly related to environment; in most cases man's action) made of a harder material than the scratched one.

Scratch WG2 /sto

An accidental or intentional manually induced superficial surface scrape, graze, cut or score.

Change in surface morphology

Coving /lisbwg3

Definition	Erosion feature consisting in a single cavity or alveole affecting the entire stone.
Relationship with the substrate	non applicable because coving refers to a surface morphology
Synonym(s)	
Older orthograph	
Sub-type(s)	
Not to be confused with	alveolization
Other remarks	Often observed when soft stone is bedded or pointed by hard mortar.
References	GRIMMER

Loss of matrix /lisbWG3

Definition	morphological change of the stone surface due to partial or selective weathering),in the form of protruding compact stone components (pebbles, fossil fragments, concretions) due to selective weathering.
Relationship with the substrate	
Synonym(s)	
Older orthograph	
Sub-type(s)	
Not to be confused with	
Other remarks	.
References	FITZNER

Microkarst /lisbwg3

Definition	Morphological changes due to the local dissolution of carbonate stone surface because of partial or selective surface water run-off. The effect creates a zone of numerous small concave irregularities in the form of watercourse runs, of millmetric to centrimetric scale.
Relationship with the substrate	Not applicable
Synonym(s)	The term "microkarst" should be preferred to "karst", "dissolution", "cratering". This last term refers to bricks, not to stone
Older orthograph	
Sub-type(s)	
Not to be confused with	alveolization, pitting
Other remarks	
References	

Pitting /lisbWG3

Definition	A formation of small depressions on a stone surface because of partial or selective weathering and localised deterioration. The pits generally have a cylindrical or conical shape, with a diameter of a few millimetres. They can be biogenically induced, especially on carbonate rocks.
Relationship with the substrate	Not applicable.
Synonym(s)	
Older orthograph	
Sub-type(s)	
Not to be confused with	Pitting consists in point like millimetric or submillimetric cavities. It should not be confused with microkarst, which is a type of relief especially concerning carbonate rocks
Other remarks	Pitting may be caused by the differential removal of components and may be the result of natural weathering or erosion. Pitting may also result from a harsh or abrasive cleaning method.
References	Normal,

Relief /lisbwg3

Definition	Remove. Synonym of relief formation
Relationship with the substrate	
Synonym(s)	
Older orthograph	
Sub-type(s)	
Not to be confused with	
Other remarks	.
References	

Relief formation /lisbwg3

Definition	Remove as a separate category. Synonym of Change in surface morphology, as title of the overall section.
Relationship with the substrate	
Synonym(s)	
Older orthograph	
Sub-type(s)	
Not to be confused with	
Other remarks	.
References	

Roughening /lisbwg3

Definition	Change of an originally smooth stone surface due to the selective loss of small particles.
Relationship with the substrate	The substrate is still sound
Synonym(s)	
Older orthograph	
Sub-type(s)	
Not to be confused with	Granular disintegration
Other remarks	It can be progressive with continuing exposure and induced because of inappropriate actions, such as aggressive cleaning.
References	

Rounding /lisbwg3

Definition	Transformation of originally angular stones as a result of preferential erosion at the block edges which results in a distinctly spherical or globular profile.
Relationship with the substrate	Not applicable
Synonym(s)	
Older orthograph	
Sub-type(s)	
Not to be confused with	
Other remarks	Rounding can be observed especially on stones which are preferably subject to granular disintegration, or in conditions that favor granular disintegration
References	

Surface retreat :lisb wg3

Propose	removal	of	this	term
Definition	A withdrawal or departure from the original exposed stone surface due to a variety of decay mechanisms, resulting in a loss of stone material. characterises a loss of stone material; could be due to loss of scales, loss of stone elements dependent on stone structure, loss of crusts (is applied only if stone material was detached together with the crust			
Relationship with the substrate				
Synonym(s)	"surface retreat" should be preferred to "back weathering"			
Older orthograph				
Sub-type(s)				
Not to be confused with				
Other remarks	.			
References	FITZNER			

Uniform Erosion /lisbwg3

Definition	Retreat of the entire stone surface in a uniform manner without creating micro-relief
Relationship with the substrate	Not applicable
Synonym(s)	Uniform recession
Older orthograph	
Sub-type(s)	
Not to be confused with	
Other remarks	Uniform erosion to be preferred to "surface retreat", "back weathering"
References	FITZNER

ISCS Glossary/English : Suggestion for new classification, and remark

TERMS	REMARKS / SUGGESTIONS
General terms	
Alteration	
Decay	
Degradation	
Weathering	
Erosion	Considered as a general term
Deterioration	This term is lacking in the glossary
Biological colonization	« Colonization » to be replaced by « growth »
Alga	
Biofilm	
Biological growth	Added to replace « biological colonization »
Lichen	
Mould	
Moss	
Plant	
Detachment	
Blistering	
Chipping	To be placed under fragmentation
Contour scaling	To be placed under « scaling » ?
Crumbling	

Delamination	To be placed under exfoliation
Disintegration	Remove, part of granular disintegration
Exfoliation	
Flaking	
Fragmentation	New term, includes Chipping, Splintering, splitting
Granular disintegration	To fall under disintegration
Peeling	
Scaling	
Spalling	Definition is glossaries not consistent with common sense in english
splintering	To be placed under fragmentation
Bursting	

Discoloration

Bleaching
Discoloration
Gloss
Moist area
Staining

Deposit

Concretion
Crust
Deposit
Efflorescence
Encrustation
Film
Graffiti
Patina
Soiling
Subflorescence

Crack & deformation

Crack	
Deformation	
Splitting	To be placed under fragmentation
Fracture	New term : means big crack

Missing part

Cavity	Should fall under alveolization ?
Gap	This term should move to the group crack & deformation
Bursting	
Loss of material	Synonym of lacuna ?
Void	To be suppressed
Missing part	
Lacuna	First moved then introduced back in the glossary

Relief formation / The title « change in surface morphology » is not appropriate because it
Differential erosion / may apply for the morphological changes due to crusts, concretions,
change in surface morphology encrustation etc..., which are not concerned by this group of terms...

Abrasion	
Alveolization	
Coving	Different opinions : remove/not remove
Cut	
Differential Erosion	To be placed under erosion ?
Uniform erosion	To be placed under erosion ?

Loss of components	
Loss of matrix	
Microkarst	
Perforation	
Pitting	
Relief	Remove :synonym of change in surface morphology (the title of this group)
Relief formation	Remove :synonym of change in surface morphology (the title of this group)
Roughening	
Rounding	
Scratch	
Surface retreat	Remove, replace by « uniform erosion » ?

ANNEX 3

Letter to the ICOMOS national committees of Thailand, Sri Lanka, Indonesia and India.....

The International Scientific Committee for Stone, during the meeting held in Lisbon, Portugal 02/11-12/05, expresses its solidarity with the countries affected by the catastrophic tsunami of last December. Without any doubt the human disaster and the effort to give the populations decent living conditions are the most urgent priorities. But our group was also deeply touched by the message from the national committee of Sri Lanka, pointing out the psychological importance of cultural heritage in the collective effort to rebuild the country.

We are aware that the monuments made of stone are not the main victims of the disaster that affected essentially vernacular heritage. Nevertheless, we would like to propose you to act as a network of experts, if you experience now or in the future any particular problem in the field of conservation of stone materials. Punctual support and technical advice could be given by individual members. As the president of the group, I could gather the possible demands from your committees and distributed them among our members.

Being conscious that our proposal is very limited, we would like to convey again our sincere sympathy.

The President

Isabelle PALLOT-FROSSARD

And the members of ISCS

Lisbon 10th of February 2005

Annex 4: Kati Winterhalter report on Cambodia/Thailand trip

Thoughts arising from the ICOMOS Stone Committee excursion to Thai and Cambodian sites of ancient cultures December 8th – 14th 2003

Kati Winterhalter
Architect, Finland

Personal comments on the excursion

The conservation expertise in Thailand seemed to be on a high level with analytical and critical thinking inside the professional teams. It is interesting to see conservation theories that have gradually become internationally accepted as “correct” to be put into use in different cultures, surroundings and with different implementations, “anastylosis”, “authenticity” and “minimum intervention” being key concepts. The same questions have to be answered irrelevant of the situation or nation, but the cultural differences give a local colour to the chosen methods.

It was very educational to see in practice the site of Prasat Sdok Kok Thom on the eastern border of Thailand with a recent case of anastylosis on the small library hall and an older case on the entrance gopura. The method used on the gopura with concrete additions is at the moment considered as false or fake and technically not correct because of contradicting materials. In addition it seemed that some of the stones were placed without proper reason. Still with the ten years of time having passed since the restoration, the structure gave an overall impression of an edifice standing reliably on its foundation, though somewhat illogical. The newly restored smaller structure of the library hall posed an interesting object for comparison. It seemed that the building had been studied with great care and precise analysis, the stones most probably had found their original places with good accuracy and the method of replacement stones followed international guidelines with a clear distinction in the treatment from the original stone material. Still the overall impression of the building gave a sense of uncertainty. It bothered me to see this; the theories applied, I feel, cannot be wrong and their application has been meticulous and critical, but still something remains not quite perfect. It is certain, that time will soften the marks of the new work and within a few years the structure will seem much more entire. But the relationship between newly done work, original, authentic work and the phenomena related to natural and biological procedures is a difficult and multifaceted question, which, may be, should be studied more as an unending process than three separate features of a monument.

The sites in Angkor were highly inspiring to me in many respects. Having seen Bangkok, the tight network of relatively low, colourless everyday building and the fenced areas of the beautifully kept temples with strong inner logic, helped to understand the extraordinary ruins of the temples of Angkor, now seemingly scattered in the jungle. A thriving wooden city crowned by geometrically astounding stone temples plastered and painted in vivid colours with water pools, big and small and expanding over a vast area; this image of ancient Angkor illuminates the memories of our site visits. The experience of imagining something only vaguely existent is definitely a major feature of the fascination of Angkor as a tourist site. Quite an opposite aspect, but certainly just as important, is the magnificence of the ruins exactly as they are.

Related to these two aspects, it seems a richness to the area, that different nationalities have had the possibility to implement different methods of restoration. I find it inspiring to see monuments in different states of deterioration. After the excursion I would have been very happy to see some reconstruction drawings aiming at recreating the atmosphere of the ancient city. Understanding authenticity in a monument is central to the aesthetical and informative experience of a monument, but in order to experience and appreciate the authenticity it is necessary, I feel, to be able to place the object in the context it has belonged to originally.

The Chinese experts working with the Chau Say Thevoda aroused different opinions in the group, some claiming, that producing replica is not theoretically correct, because the original and the “fakes” are easily mixed by the layman. I did not find the replicas a problem; the new stones could be carved with a logo of the present year to identify them. What I did find a problem was that the information, by which the ornamentation was realised, was not always accurate. For example an ornament of the

façade surface turned around the corner to continue inside a window opening, which solution did not seem to be an authentic one. It seems that mistakes like these would be easily avoided if there would be open discussion between the restoration groups.

In many of the sites the method chosen is to maintain the sites as they are with as little intervention as possible. The Banteay Srei seemed to be a model example of careful monitoring and risk analysis, with a mapping reaching down to the level of single trees. I found the site a good example of how minute research gives quite precise answers to questions seemingly complicated and difficult to handle at the first sight. Compared with the complex and wide area of Preah Khan, Banteay Srei is definitely easy to handle, but maybe with a similar strategy the structural problems of Preah Khan or Ta Prohm could be seen in advance and thus prevented. I found the work done in Banteay Srei professional because of the discipline and good organization of the research work. Also from inside our group I heard some critique on the fact that the experts on Banteay Srei had not yet done anything with the monument. This "slowness" I find only a positive aspect. The monuments have stood for nearly a thousand years – there is definitely no hurry in leaving the signs of the 21st century on the monuments, unless the deeds done are thoroughly thought through.

I understood that H. Marchal, who did the reconstruction of Banteay Srei in the 1930's also did an accurate documentation of his work and that this documentation now is of great value to the present work. It seems utterly important that APSARA can produce an efficient way of archiving all material produced on Angkor, and that the material should be available to all researchers and experts working on the monuments. Also APSARA should have some norms on how to produce the material and what aspects should be taken into account. The role of APSARA should be active in educating a generation of experts with a broad view, able to analyse the different aspects of chosen methods in relation to the entire area of Angkor, not only to specific temples.

A final comment I want to make as an architect, I believe is a phenomenon related to the modern society of highly specialized experts. The discussions we had of the details of stone conservation, especially related to the cleaning and consolidating of stone material, were altogether very interesting and important. Still during these discussions it crossed my mind more than once, that actually the questions related to the conservation of the stone material itself was more or less marginal in many of the sites we visited. The broader questions of site maintenance, salts and moisture within the stone and the structure, bigger plants and the growing amount of tourists etc. are the real hazards to the sites. It is natural that all specialists see the sites through the lens of their specific field, but all work done in small scale should be necessitated by research and implementation decisions made in larger scale.

Having visited the sites only very briefly, I'm afraid I may have misunderstood some aspects or simplified matters. I still felt enticed to say out my thoughts straight forward and wish that misinterpretations be left without attention. The experience of the excursion has left me spell bound by these ancient cultures.

January 19th, 2004