ILLUSTRATED GLOSSARY
ON STONE DETERIORATION PATTERNS

English-Arabic Version / النسخة الإنجليزية العربية

MONUMENTS AND SITES
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English version / Version Anglaise

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The Translators’ Introduction

This Illustrated Glossary on Stone Deterioration Patterns, published by the International Scientific Committee of the stones ISCS, has been translated to a large number of languages.

Its translation into Arabic was thus certainly something we had to do to enrich the Arabic library in this field. We formed a team of specialists coming from different Arab countries in order to translate and adapt it to the Arabic language. This team worked hard to introduce this specialized glossary in its final form.

It is worth mentioning the fact that Mis May SHAER was the first to embark on this initiative.

Being aware of the richness of the Arabic language, its breadth, comprehensiveness and frequent vocabulary, we were determined to be very careful to choose the appropriate term and explain it in a simple and easy manner away from redundancy and inappropriateness. In the case of disagreement about any term, we opted for a unanimous agreed upon one.

Our primary goal in this glossary is to unify the Arabic terminology and scrutinize its equivalent in English.

We hope that this English-Arabic edition will be of a good help for students, researchers and practitioners in the field of conservation and preservation of stones.

M.Hamiane & Others
The ICOMOS International Scientific Committee for Stone (ISCS) is providing a forum for the interchange of experience, ideas, and knowledge in the field of stone conservation. ISCS aims at facilitating the publication, dissemination and presentation of state of the art reviews on pre-identified issues. Simplification and demystification of scientific information for practitioners are also part of the main goals of the group.

In studies on stone deterioration and conservation, terminological confusions lead to major communication problems between scientists, conservators and practitioners. In this context, it is of primary importance to set up a common language; if degradation patterns can be shown, named and described, then they can be recognised and compared with similar ones in a more accurate way in further investigations.

The ISCS glossary constitutes an important tool for scientific discussions on decay phenomena and processes. It is also an excellent basis for tutorials on stone deterioration. It is based on the careful examination of pre-existing glossaries of English terms. It does not aim at replacing these glossaries, often set up originally in a language other than English, and for most of them done to a high standard.

As President of ICOMOS I would like to congratulate the International Scientific Committee for Stone and its President Véronique Verges-Belmin for the results of years of research presented in this publication. Stone conservation is a crucial topic in monument conservation and many of our National Committees all over the world hope for advice and help from the specialists familiar with traditional and modern methods of conservation. The Illustrated Glossary on Stone Deterioration Patterns offers a wide range of suggestions and practical advice. Probably, after the English-French version becomes available the Glossary will also be translated into other languages. In view of the accelerating decay of our stone monuments worldwide this is an exemplary contribution which will promote the international cooperation so important in this field.

Michal Petzet, past President of ICOMOS
Gustavo Araoz, President of ICOMOS
Stefan Simon, President ISCS ICOMOS
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ICOMOS International Scientific Committee for Stone (ISCS).

اللجنة العلمية الدولية للحجر.
ICOMOS-ISCS:
ILLUSTRATED GLOSSARY ON STONE DETERIORATION PATTERNS
المسرد المصور لأطعمة تلف الحجارة

DEGRADATION  تدهور
DETERIORATION  تلف
WEATHERING  تجوية

DISINTEGRATION  تفكك
FRAGMENTATION  تجزؤ
PEELING  قشرة
SCALING  تقشير

MISTAKES:  تبكّر
MICROKARST  تجعید
MISSING PART  جزء مفقود
PERFORATION  ثقب
PITTING  تنقّر

FILM  غشاء
GLOSSY ASPECT  جانب مصقول
GRAFFITI  خريشات
PATINA  غشاء العنق
SOILING  اوساخ
SUBFLORESCENCE  تزهّر

LICHEN  أشنات
Moss  حزاز
MOULD  عفن
PLANT  نبات

ICOMOS International Scientific Committee for Stone (ISCS).
In 2001, when the group began its compiling task, seven documents, comprising various numbers of entries were identified as a basis for collecting and combining useful terms into a generalised glossary.

The oldest one is an unpublished list of 21 terms written by A. Arnold, D. Jeannette and K. Zehnder (1980), who performed that task within the framework of the ISCS-petrography group activities. This glossary includes an alphabetical list of terms in English, French and German, with related definitions in the three languages.


The third document is the Italian Standard Normal 1/88 published in 1990 and called “Alterazioni macroscopiche dei materiali lapidei : lessico”. Each one of the 27 terms in this glossary is illustrated by photographs, usually in two different scales and by a graphic chart to be used if mapping of deterioration patterns is needed.

This glossary, and related definitions have been translated into English by Apy Elena Charola. This author has also translated the terms, without their definitions, into Spanish and Portuguese.

The fourth set of documents is a proposal for a terminology of stone decay forms on monuments, written by Jose Delgado Rodrigues from LNEC (Lisbon, Portugal). It comprises 26 terms, and was largely inspired in internal documents produced in the framework of the Petrography Group of the ICOMOS Stone Committee and published in its newsletter in 1991.

This proposal was used as a basis for the publication by LNEC, in 2004, of a glossary with short definitions in Portuguese language, including terms related to stone, masonry and render deterioration (Henriques et al., 2004). Each term is translated into French, Italian and Spanish, and is associated with a graphic chart.

The fifth document is a detailed contribution by B. Fitzner, K. Heinrichs & R. Kownatzki (1995), on classification and mapping of weathering forms, which was updated in 2002 by Fitzner & Heinrichs. This document presents as well definitions of terms which are found in a slightly altered form in the present glossary, as an introduction into the mapping of stone damages. The thoroughly illustrated document classifies decay patterns on the basis of type and intensity. A colour and graphic chart is proposed, in the same way as the one which can be found in the Italian Standard Normal 1/88.

The sixth document (Franke et al. 1998) is a multi-authored book published as a deliverable of a FP5 European Commission research program. The document is an Atlas and a classification of brick masonry deterioration. It deals both with deterioration of the material (bricks, joint and pointing mortars), and with degradation of the whole masonry. It was developed together with an expert system, of which the acronym is MDDS, which stands for “Masonry Damage Diagnostic System”. In fact all damage types contained in the document are to be found in the expert system (Van Hees et al 1995), aiming at helping decision makers to diagnose the origin of deterioration and select appropriate methods and materials for brick masonry restoration.

The most recent document has been set up by a group of experts from Germany (VDI 3798. 1998) VDI stands for “Verein Deutscher Ingenieure, i.e. Association of German Engineers”. This document is quite close to a standard, and it is composed of a list of 14 terms in German, with a translation into English, accompanied by a definition and illustrations. A proposal for graphic representation of the decay patterns is also provided, as in the Italian Standard and in the Fitzner system.

Although we did our best to gather all the available information, we have obviously missed a number of documents. One of them is an illustrated glossary of 30 terms edited by the “Queen’s University of Belfast” (U.K.). On its website (http://www.qub.ac.uk) one can find a comprehensive weathering features tutorial, which includes both degradation patterns of monuments and natural outcrops, and also refers to anthropogenic damage.

To set up the French version of the glossary, the translators have consulted the background glossaries having terms and definitions in French, and also the following documents: Paper by De Henau & Tourneur (1998/99), book Dicobat, edited by De Vigan et al. (1990), and CRISTAL glossary, set up in 1999 within the frame of European project Rephrael.
ICOMOS International Scientific Committee for Stone (ISCS)

The sixth document (Frank et al., 1998) is a report from a research program funded by the European Commission within the framework of the fifth program. This document consists of a map and a catalog of building damage caused by deterioration in stone materials in use in construction (stone, mortar, and masonry). It has been computerized with a "Masonry Damage Diagnostic System" (MDDS), which is an expert system. The types of damage covered in this document were included in the system (Van Hees et al., 1995), and are intended to help decision makers identify the cause of damage in order to choose appropriate materials and methods for repair.

A new document in 1998 was prepared by a group of experts (VDI 3798, 1998). It is a dictionary of terms in the German language, with English translations, and is accompanied by definitions and illustrations. It contains a proposal for a graphical representation of the various types of damage, as is done in the "LNEC", an Italian standard and the "Tafel" system.

Despite our best efforts to gather all available information, some important documents and books have been overlooked. An example of this is a book published by the "Queen's University Belfast" in the UK (http://www.qub.ac.uk) which includes a simplified educational program on atmospheric effects and their impact on heritage and buildings. This work is in the frame of the European project "Raphael" (1999-2002).

This document was recently updated in 2001 by Fetscher, Heinrichs, and G. Kaunzner (2004), which has been translated into French and Spanish and accompanied by a technical annex. This document presents the authors' views on the subject and is intended to cover the most common types of damage in stone materials.

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The glossary is arranged into 6 families composed of 2 to 11 terms:

- General terms,
- Crack and deformation,
- Detachment,
- Features induced by material loss,
- Discoloration and deposit,
- Biological colonization

As far as possible, the authors have kept within strict limits, describing deterioration patterns observable by the naked eye. Only a few families deviate from this general rule, for instance "mechanical damage" which includes terms such as "Impact damage", "Cut", "Scratch", "Abrasion", and which is clearly process and not feature oriented.

We have chosen to create a specific family including terms related to surface morphologies, called "Features induced by material loss". This family is important because it contains terms allowing a deterioration pattern to be described even if there is no active material loss at the time the object is described. For instance a surface showing alveolarization may be subjected to active granular disintegration or scaling. If there is no more stone loss from the surface, it will still have an alveolar relief, but with no further loss of material, and the surface will have a tendency to soil. The same is applicable to "erosion" and "biological colonization", because a surface may have eroded first and then be colonized by algae, lichen or mosses.

The ISCS glossary only contains terms related to stone material as an individual element within a built object or sculpture. As a consequence, the terms do not relate to the description of the deterioration of a stone masonry structure as a whole.

How to find out a particular term in the glossary?
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### ALTERATION
Modification of the material that does not necessarily imply a worsening of its characteristics from the point of view of conservation. For instance, a reversible coating applied on a stone may be considered as an alteration.

### DAMAGE
Human perception of the loss of value due to decay.

### DECAY
Any chemical or physical modification of the intrinsic stone properties leading to a loss of value or to the impairment of use.

### DEGRADATION
Decline in condition, quality, or functional capacity.

### DETERIORATION
Process of making or becoming worse or lower in quality, value, character, etc…; depreciation.

### WEATHERING
Any chemical or mechanical process by which stones exposed to the weather undergo changes in character and deteriorate.
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| **Common alteration** of architectural mouldings by algae.  

Commonalteration of architectural mouldings by algae.  

| **Degradation** of red sandstone masonry due to defective rainwater gutter behind parapet.  

Degradationof red sandstone masonry due to defective rainwater gutter behind parapet. | **Damage** to the lower part of a sandstone grave slab resulting in loss of value.  

**Damage** to the lower part of a sandstone grave slab resulting in loss of value.  

| **Deterioration** of a Carboniferous sandstone masonry.  

Deteriorationof a Carboniferous sandstone masonry. | **Limestone relief showing advanced decay.**  

Limestone relief showing advanced decay.  

| **Weathering** of a Lewisian Gneiss monolith resulting from long term exposure to the elements.  

Weatheringof a Lewisian Gneiss monolith resulting from long term exposure to the elements. |

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Scotland, Edinburgh, North Castle Street, 1993. Individual block heights approx. 30cm, Pers. Archive (ref. OU 13) / I. Maxwell

France, Caen, Église Saint-Pierre, 2006. head ca.10 cm, LRMH / V. Vergès-Belmin

**Definition:**
Individual fissure, clearly visible by the naked eye, resulting from separation of one part from another.

**Equivalent terms to be found in other glossaries:**
Fissure, fault, joint.

**Sub-type(s):**
- Fracture : Crack that crosses completely the stone piece
- Star crack : Crack having the form of a star. Rusting iron or mechanical impact are possible causes of this type of damage.
- Hair crack : Minor crack with width dimension < 0.1 mm
- Craquele : Network of minor cracks also called crack network. The term crazing is not appropriate for stone, as this term should be used for describing the development of a crack network on glazed terracotta.
- Splitting : Fracturing of a stone along planes of weakness such as microcracks or clay/silt layers, in case where the structural elements are orientated vertically. For instance, a column may split into several parts along bedding planes if the load above it is too high.

**Not to be confused with:**
- Delamination, which consists of detachment along bedding or schistosity planes, not necessarily orientated vertically. In delamination, mechanical overload is not noticeable. Delamination is transitional to splitting.

**Other remarks:**
Cracking may be due to weathering, flaws in the stone, static problems, rusting dowels, too hard repointing mortar. Vibration caused by earth tremors, fire, frost may also induce cracking. Cracks and fractures occurring on rock carved surfaces are usually named after the geological terminology: joint if there is no displacement of one side with respect to the other, fault if there is a displacement.

**التعريف:**
كسر منفرد، واضح الرؤية للعين المجردة، ويكون نتيجة انفصال جزء من الحجر عن الآخر.

**مصطلحات مرادفة قد يتم ورودها في مسارد أخرى:**
شق، كسر، فتح، شق جيولوجي.

**أنواع فرعية:**
- كسر: صدع يقطع بشكل كامل قطعة الحجر بشكل كامل.
- كسر نجمي: صدع على شكل نجمة. من الأسباب التي قد تؤدي لهذا النوع من الصدع ضغط الحديد والتصعيد أو فتق الأثر الميكانيكي.
- صدع شعري: صدع طفيف يبلغ عرضه < 0.1 مم.
- كسر شعري: كسر طيفي بعرضه > 0.1 مم.
- تقلع: شبكة من الصدوع الثانوية وتطبق عليها مصطلح شبكة الصدع. لا يمكن استخدام مصطلح تجزع للحجر إلا إذا كان يوجد تطور شبكة تصدعات الفخار المصقول.
- انفصال: هي انفصال البناء وقلع المواقع المحفوفة على طول الطبقات الجيولوجية مثل أماكن الصدوع الجزئية أو الطبقات الطينية. في حالة وجود هذه العناصر بشكل عمودي. على سبيل المثال: قد ينفصل عمود على أجزاء عند الطبقات الرسمية للحجر إذا كانت الأحجار من أعلى عالية جدا.

**ينبغي عدم الخلط مع مصطلح:**
- انفصال طبقي، والذي يمثل ظاهرة الانفصال عند طبقات الطبقات النسبية للحجر، ولا يكون بالضرورة بالانفصال الأفقي. وفي هذه الحالة لا تكون الأحجار الزيادة الميكانيكية جيدة بالمناظر ويعتبر الانفصال الطبيجي مرحلة إنطلاقية تؤدي للانفصال.

**ملاحظات أخرى:**
قد يكون النصر نسبة التحويه، أو وجود عيب في الحجر، أو مشاكل إنشائية، أو قد يستخدم مادة شديدة الصداقة في عملية التكحل.
كما قد ينتج النصر نتيجة الإنتاج بسبب الهرات الأرضية، أو الحرائق، أو التساقط.
عادة يتم تسمية الشقوق والتمزقات التي تظهر على الواجهات المحتوية في الصخر حسب المصطلحات الجيولوجية: ففصل في حالة عدم وجود إزراج لظرف بالنسبة للآخر، فصل في حالة وجود الإزراج.

**CRACK • صدع • DEFORMATION • تشوه**
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<td>Marble sculpture showing a network of thin cracks (craquele).</td>
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<td>[Image]</td>
<td>Horizontal fracture due to a rusted iron clamp.</td>
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<tr>
<td>[Image]</td>
<td>Star crack on sandstone resulting from corrosion and expansion of an iron fixing at the base of a grave slab.</td>
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<tr>
<td>[Image]</td>
<td>Vertical Hair cracks have developed on protruding parts located between the flutes of this column.</td>
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<td>Splitting of a limestone column.</td>
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France, Versailles, Castle Park, 2002. Large side : 0.8m. LRMH / V. Vergès-Belmin


Greece, Athens, 2004. KDC Ochling / S. Simon

France, Vienne, Saint-André-le-Bas church, cloister, 1981. Column diameter c.15 cm. LRMH DIA00006991 / J.P. Bozellec

*ICOMOS* International Scientific Committee for Stone (ISCS).
CRACK & DEFORMATION

Definition:
Change in shape without losing integrity, leading to bending, buckling or twisting of a stone block.

Equivalent terms to be found in other glossaries:
Plastic deformation, bowing.

Other remarks:
This degradation pattern mainly affects crystalline marble slabs (tombstones, marble cladding).

التعريف:
تغيير في الشكل دون فقدان كماله، مما يؤدي إلى إنحناء (مقعر أو محدب)، التواء أو فتل كتلة الحجر.

مصطلحات مرادفة قد يتم ورودها في مصادر أخرى:
تشوه لدن، الإحناء.

ملاحظات أخرى:
غالبا ما يؤثر هذا النمط على أقواس الرخام المتبلور (شواهد القبور، البلاط الرخامي).
This white marble plate is showing a convex deformation.

تظهر هذه اللوحة من الرخام الأبيض تشوهًا محدبًا.

France, Queyras, Ville-Vieille, 1990. Plate size 0.7 x 2 m. LRMH / V. Vergès-Belmin

The white marble plate of this XIXth century stele is showing a concave deformation.

تظهر هذه اللوحة من الرخام الأبيض والتي تعود إلى القرن التاسع عشر تشوهًا مقعرًا.

France, Sélestat (Haut-Rhin), Cemetery, 1995. Plate size 0.4 x 1m. LRMH / V. Vergès-Belmin

Marble panel out of line. The convex deformation is visible due to oblique light.

تشوه محدب للوحة من الرخام ويدول أكثراً بوضوح بسبب الضوء المائل.

Definition:
Separated, air-filled, raised hemispherical elevations on the face of stone resulting from the detachment of an outer stone layer. This detachment is not related to the stone structure.

Equivalent terms to be found in other glossaries:
-

Other remarks:
Blistering, in some circumstances, is caused by soluble salts action.
Blistering on surface of molasse sandstone.


Blistering of sandstone masonry caused by expansion of the weathered surface layer leading to loss of the stone surface.


The left cheek of the limestone figure shows blistering.


ظهر تورّم على سطح حجر رملي الصفحي.

ظهر تورّم في مبنى من الحجر الرملي وهو ناجم عن انتفاخ في الطبقة السطحية للحجرة المختلطة مما يؤدي إلى فقدان سطح الحجرة.
**BURSTING**

**Definition:**
Local loss of the stone surface from internal pressure usually manifesting in the form of an irregularly-sided crater.

**Equivalent terms to be found in other glossaries:**
Break out.

**Not to be confused with:**
- Impact damage: loss of material due to a mechanical impact, which may have crater shape if the object hitting the stone surface is hard and small (a bullet for instance).

**Other remarks:**
Bursting is sometimes preceded by star-shaped face-fracturing. This deterioration pattern is due to the increase of volume of mineral inclusions (clays, iron minerals, etc.) naturally contained in the stone and situated near its surface. The corrosion of metallic reinforcing elements may also induce bursting.

**التعريف:**
فقدان محلي لسطح الحجر نتيجة ضغط داخلي ويكون عادة على شكل حفرة غير منتظمة الجوانب.

**مصطلحات مرادفة قد يتم ورودها في مصادر أخرى:**
الانفجار، الانفجارات الدائاع.

**يجب عدم الخلط مع مصطلح:**
- ضرر الاصطدام: فقدان المادة نتيجة قوة ميكانيكية، والتي قد تكون على شكل حفرة إذا كان الشيء الذي أصاب سطح الحجر صغير الحجم وصلب (مثل الرصاصة).

**ملاحظات أخرى:**
يسبق الانفجار أحياناً تمزقًا للسطح يكون على شكل نجمة. وركز هذه الظاهرة نتيجة زيادة في حجم المعادن (المواد الطينية، الحديد، إلخ.) الموجودة بشكل طبيعي في الحجر ومتمركزة عند سطحه. ويمكن أن يؤدي تآكل العناصر المثبتة للمعادن إلى الإنفجار.
Bursting of this limestone element was most probably due to volume expansion linked to the corrosion of the iron clamp.

انثاث هذا الجزء من الحجر الجيري يعود على الأرجح إلى حجم توسع المشبك الحديدي المتأكل.

Portugal, Lisbon, Jeronimo Cloister, 2005. Length of stone, 50 cm. IDK Dresden / C.Franzen

Typical bursting at flat wall marble panel.

انثاث نموذجي للوحة تكسية من الرخام في جدار المبنى.


Bursting due to corrosion and expansion of a metal fixing at the base of a sandstone grave slab.

انثاث بسبب تآكل و توسع نظام الثبيت المعدني في قاعدة شاهد قبر.

DETACHMENT
انفصال

DELAMINATION
انفصال طبقي

**Definition:**
Detachment process affecting laminated stones (most of sedimentary rocks, some metamorphic rocks...). It corresponds to a physical separation into one or several layers following the stone laminae. The thickness and the shape of the layers are variable. The layers may be oriented in any direction with regards to the stone surface.

**Equivalent terms to be found in other glossaries:**
Layering.

**Sub-type(s):**
- Exfoliation: detachment of multiple thin stone layers (cm scale) that are sub-parallel to the stone surface. The layers may bend, twist in a similar way as book pages.

**Not to be confused with:**
- Scaling: kind of detachment totally independent of the stone structure.

**Other remarks:**
Efflorescences and biological colonization can be detected in-between the laminae.

**بالعربية:**
عملية انفصال تؤثر على الحجر المكون من عدة الطبقات (أي معظم الصخور الترسبية، وبعض الصخور المتحولة...). وهي عملية انفصال الحجر على امتداد سطوح الطبق، وتشتت سماكة وأشكال الطبقات من حجر آخر.

المصطلحات مرادفة قد يتم ورودها في مسارد أخرى:
تطبق

أنواع فرعية:
تورَق: انفصال على شكل طبقات رقيقة من الحجر (بمقياس سم) وهي شبه متوازية مع سطح الحجر. ويمكن لتلك الطبقات أن تحتى أو تقلل مثل صفحات الكتاب.

يجب عدم الخلط مع مصطلح:
تشر (طبقات كبيرة الحجم): نوع من الانفصال يكون مستقلًا تمامًا عن بنية الحجر.

الملاحظات أخرى:
يمكن ملاحظة ظهور الأملاح والاستيطان البيولوجي ما بين الطبقات.
Delamination of a sandstone gravestone possibly resulting from frost action.


Delamination of a sandstone element.

India, Fatehpur Sikri, 2003. Stone width : c. 50 cm. LRMH / V. Vergès-Belmin

Sandstone exfoliation. This subtype of delamination is characterised by a detachment of multiple thin stone layers sub-parallel to the stone surface.

Definition:
Detachment of single grains or aggregates of grains.

Relationship with the substrate:
It affects only the surface of the stone or can occur in depth. Damage generally starts from the surface of the material. On crystalline marble, granular disintegration may reach several centimeters in depth, sometimes more.

Equivalent terms to be found in other glossaries:
Loss of cohesion, incoherence, decohesion, friability, disaggregation, intergranular incoherence, pulverization.

Sub-type(s):
- Crumbling: Detachment of aggregates of grains from the substrate. These aggregates are generally limited in size (less than 2 cm). This size depends on the nature of the stone and its environment.
- Granular disintegration: Occurs in granular sedimentary (e.g. sandstone) and granular crystalline (e.g. granite) stones. Granular disintegration produces debris referred to as a rock meal and can often be seen accumulating at the foot of wall actively deteriorating. If the stone surface forms a cavity (coving), the detached material may accumulate through gravity on the lower part of the cavity. The grain size of the stone determines the size of the resulting detached material. The following specific terms, all related to granular disintegration, refer either to the size, or to the aspect of corresponding grains:
  - Powdering, Chalking: terms sometimes employed for describing granular disintegration of finely grained stones.
  - Sugaring: employed mainly for white crystalline marble.
  - Sanding: used to describe granular disintegration of sandstones and granites.

Other remarks:
In the case of crystalline marbles, thermal stresses are known to be one of the main causes of granular disintegration, thus leading occasionally to deformation patterns. Stones may display deterioration patterns intermediate between granular disintegration and crumbling, scaling or delamination. Partial or selective granular disintegration often leads to surface features such as alveolization or rounding. When occurring inside crystalline marble, granular disintegration may lead to deformation patterns.

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This limestone element shows **powdering**, appearing as whiter zones with an irregular surface aspect.

**Sugaring** developing on the head of a marble sculpture.

Sanding of a coarse grained granite.

Crumbling of a crystalline marble.

Typical sugaring or loosening of the calcite crystals at the surface of the marble.

France, Poitiers, Notre-Dame-la-Grande church, 1993. Head size: c. 20 cm. LRMH / D. Bouchardon

Germany, Munich, Propyläen, Königsplatz, Tympanon.
KDC Olching / S. Simon

Portugal, Évora, Cathedral, 2005. LNEC / J. Delgado Rodrigues

Czech Republic, Nedvedice, South Moravia, Pernstejn Castle, 2005.
Area about 150 cm2.
National Heritage of the Czech Rep./ D. Michoinova

**FRAGMENTATION**

**Definition:**
The complete or partial breaking up of a stone, into portions of variable dimensions that are irregular in form, thickness and volume.

**Relationship with the substrate:**
The substrate remains apparently sound on both sides of the detachment plane. Fragmentation may occasionally affect the entire stone block, and may follow discontinuity planes.

**Equivalent terms to be found in other glossaries:**
- 

**Sub-type(s):**
- Splintering: Detachment of sharp, slender pieces of stone, split or broken off from the main body.
- Chipping: Breaking off of pieces, called chips, from the edges of a block.

**Other remarks:**
Fragmentation may be found when stone blocks are subjected to an overload. Upper parts as well as lower parts of monolithic columns are particularly prone to chipping and splintering (large weight supported by a small area).

**التعريف:**
الكسر بشكل كامل أو جزئي للحجر كقطع مختلفة الأبعاد وغير منتظمة في الشكل والسمك والحجم.

**العلاقة مع الطبقة السفلية الأصلية:**
تبقى الطبقة السفلية سليمة على كلا جانبي مسطح الإنفصال. وقد يؤثر الجهرة أحيانا على كتلة الحجر كاملا كما قد يتبع مسطحات غير منتظمة.

**مصطلحات مرادفة قد يتم ورودها في مسارد أخرى:**
- 

**أنواع فرعية:**
- انشقاق: إنفصال قطع حجرية حادة ونحيلة متقسمة أو مكسورة من الكتلة الرئيسية.
- تشظي: تكسر القطع عند حواف كتلة الحجر، تسمى رقائق.

**ملاحظات أخرى:**
يمكن للتجزؤ أن يحدث عند تعرض الكتل الحجرية لأحمال زائدة. عادة تكون الأجزاء العلوية والسفلية للأعمدة المكونة من كتلة واحدة معرضة بشكل خاص للانشقاق والتقاطع (وزن ثقيل مسند بساحة صغيرة).
The **splintering** of this limestone block has resulted in a succession of cupule-like depressions on the stone surface.

Fragmentation of the upper part of a monolithic limestone column.

Limestone, **chipping** (final state). Chipping occurred under high compression, after the replacement the lower block of the column.

**Fragmentation** of a dense limestone slab exposed in the church exterior wall.

Soft limestone, **chipping** due to overload on the structure supporting a balcony.

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*Egypt, Karnak temple, block fields, KDC Olching / S. Simon*

*France, Saint-Benoît-sur-Loire, 1996. Fracture length : 30cm. CI-CRP / P. Bromblet*

*Belgium, Leuven (Louvain), 2005. Height of the stone blocks : 40 to 50 cm. TNO / R. van Hees*

*Germany, Munich, 1998. Picture 60 cm width approximately. LNEC / J. Delgado Rodrigues*

*Malta, Valletta, 2006. Small side of the photo : c. 2m. LRMH / V. Vergès-Belmin*
DETACHMENT
انفصال

PEELING
قشارة

**Definition:**
Shedding, coming off, or partial detachment of a superficial layer (thickness: submillimetric to millimetric) having the aspect of a film or coating which has been applied on the stone surface.

**Equivalent terms to be found in other glossaries:**
Peeling off.

**Not to be confused with:**
- Blistering, which is associated with a dome-like morphology.
- Scaling, which is related to the detachment of stone layers (thickness: millimetric to centimetric).

**المصطلح:**
إزالة أو انفصال جزئي لطبقة سطحية للحجر (تكون سماكتها ما بين أقل من ميلمتر إلى بضعة ميلمترات) وتبدو كمظهر غشاء تم وضعه فوق سطح الحجر.

**مصطلحات مرادفة قد يتم ورودها في مسارد أخرى:**
قشارة

**يجب عدم الخلط مع مصطلح:**
- تورَم وهي ترتبط بالشكل الذي يشبه القبة.
- تقشر (طبقات سميك) تتعلق بإنفصال طبقات الحجر (تكون سماكتها ما بين بضعة ملمترات إلى سنتمترات).
Peeling of a surface layer on a limestone element.

France, Chartres, Cathedral, northern portal, 2005. Size of the figure: c. 15 cm. LRMH / V. Vergès-Belmin.

Peeling linked to salt crystallization at the surface of a magnesian limestone.

Definition:
Detachment of stone as a scale or a stack of scales, not following any stone structure and detaching like fish scales or parallel to the stone surface. The thickness of a scale is generally of millimetric to centimetric scale, and is negligible compared to its surface dimension.

Relationship with the substrate:
The plane of detachment of the scales is located near the stone surface (a fraction of millimeters to several centimeters).

Equivalent terms to be found in other glossaries:
Desquamation, Scale, plaque or plaquette describe exclusively the features, and not the process.

Sub-type(s):
- Flaking: scaling in thin flat or curved scales of submillimetric to millimetric thickness, organized as fish scales.
- Contour scaling: scaling in which the interface with the sound part of the stone is parallel to the stone surface. In the case of flat surfaces, contour scaling may be called spalling. Case hardening is a synonym of contour scaling.

Not to be confused with:
- Delamination: corresponds to a detachment following the bedding or shistosity planes of a stone.
Detached scaling 4mm thick on sandstone block base course.

Contour scaling, developing on a magmatic stone element (Kersanton).

Some of the flat dimension stones show complete or partial contour scaling, which may be called here spalling.

Sandstone block contaminated with sodium chloride. Salt crystallization induces granular disintegration and scaling of the stone. As scales are very thin, the degradation pattern is also called flaking.
Definition:
Formation, on the stone surface, of cavities (alveoles) which may be interconnected and may have variable shapes and sizes (generally centimetric, sometimes metric).

Equivalent terms to be found in other glossaries:
Alveolar erosion, alveolar weathering, honeycomb.

Sub-type(s):
- Coving: erosion feature consisting in a single alveole developing from the edge of the stone block.

Other remarks:
Alveolization is a kind of is a differential weathering possibly due to inhomogeneities in physical or chemical properties of the stone. Alveolization may occur with other degradation patterns such as granular disintegration and/or scaling. In those particular cases in which alveolization develops mainly in depth in a diverticular manner, it can be referred to as vermicular alveolization. In arid climates large size alveoles of meter size are frequently formed (e.g. Petra Jordan).

Not to be confused with:
- Microkarst: refers to a network of millimetric to centimetric interconnected depressions, clearly linked to a dissolution process.
- Pitting: corresponds to the formation of point-like millimetric to submillimetric pits, generally not connected, on a stone surface.
Disaggregation of individual geologically weaker sandstone blocks due to the consequential effect of repointing the joints and beds with a too hard and durable cementitious mortar. As a result, a single alveole (coving) has developed from the sides of the bloc.

.deep alveolization of a sandstone block.

Pers. Archive Ref MQ 14 / I. Maxwell

Alveolization develops here as cavities illustrating a combination of honeycombs and alignments following the natural bedding planes of the sandstone.


Alveolization of a porous limestone.


Deep alveolization of a sandstone block.

Italy, South Tyrol, Terlano/Terlan, Maria Himmelfahrt/Maria Assunta, Sandstone, 2000. Length of stone, 80 cm. IMP Uni Innsbruck / C. Franzen
**FEATURES INDUCED BY MATERIAL LOSS**

**ICOMOS International Scientific Committee for Stone (ISCS).**

**اللجنة العلمية الدولية للحجارة**

**Definitions**:

**Loss of original surface, leading to smoothed shapes.**

**Equivalent terms to be found in other glossaries**: Loss of material is a very general expression, that refers to any loss of original surface, which can be due to a variety of reasons such as granular disintegration, scaling etc.. This term is too vague and should not be used.

**Sub-type(s)**:

- **Differential erosion**: to be preferred to differential deterioration: occurs when erosion does not proceed at the same rate from one area of the stone to the other. As a result, the stone deteriorates irregularly. This feature is found on heterogeneous stones containing harder and/or less porous zones. It may also occur as a result of selective lichen attack on calcitic stones. Differential erosion is generally found on sedimentary and volcanic stones. Differential erosion is synonymous with relief formation, i.e. to the formation of irregularities on the stone surface. Differential erosion may result in loss of components or loss of matrix of the stone:

  - **Loss of components**: Partial or selective elimination of soft (clay lenticles, nodes of limonite, etc) or compact stone components (pebbles, fossil fragments, geological concretions, lava fragments).
  - **Loss of matrix**: Partial or selective elimination of the stone matrix, resulting in protruding compact stone components.

- **Rounding**: Preferential erosion of originally angular stone edges leading to a distinctly rounded profile. Rounding can especially be observed on stones which preferably deteriorate through granular disintegration, or when environmental conditions favor granular disintegration.

- **Roughening**: Selective loss of small particles from an originally smooth stone surface. The substrate is still sound. Roughening can appear either progressively in case of long term deterioration process (for instance in case of granular disintegration), or instantaneously in case of inappropriate actions, such as aggressive cleaning.

**Other remarks**:

Erosion may have natural and/or anthropogenic causes. It can be due to chemical, physical or/biological processes.

**icz**

**Definitions**:

**فقدان للسطح الأصلي للحجر مما يؤدي إلى أشكال ملساء.**

**مصطلحات مرادفة قد يتم ورودها في مسارد أخرى**: **فقدان المادة** "المادة" هو عام ويشير إلى أي نوع من فقدان السطح الأصلي. والذي قد يكون نتيجة مجموعة من الأسباب مثل التشقح الحيوي، التفكير، إلخ. وهذا المصطلح نادر ويجب عدم إستخدامه.

**أنواع فرعية**:

- **التآكل المتباين**: ويفضل على مصطلح التلف المتباين والذي يحصل عندما يختلف معدل التآكل بين المناطق المختلفة للحجر. وتبتعد تلك الظاهرة في الحجر غير المتجانس الذي يحتوي على مناطق أكثر صلابة وأقل مسامية. وقد يظهر أيضا نتيجة هجوم الحزاز على الحجر الكلسي. وتظهر التآكل التلفي للحاوية الترسبية على الحجر الكلسي. وتظهر التآكل التلفي للحاوية الترسبية والبركانية. التآكل المتباين هو مرادف لمصطلح "تشكل بروزات" وهي تشكيلات غير منتظمة على سطح الحجر. ويمكن أن يكون التآكل التلفي نتيجة فقد عناصر أو فقد نسيج الحجر.

- **فقدان النسيج**: إزالة عناصر الحجر الطرية (الإجزاء الطينية، الرقائق، الحبيبات البركانية)، بشكل جزئي أو إنتقائي.

- **التلف السطحي**: إزالة التلف بشكل جزئي أو إنتقائي يؤدي إلى بروز متراصة من الحجر.

- **الكشف الطيفي**: إزالة عناصر الحجر ذات الزرايا الجافة (الإجزاء الطينية، الرقائق، الحبيبات البركانية) أو الإجزاء الطينية، الرقائق، الحبيبات البركانية.

- **التسهيلات**: فقدان إضافي لجسيمات من سطح الحجر أملس. وتكون نموذجة بروز من سطح الحجر الجليدي أو عندما تعبد الظروف الجوية التلفي الحيوي.

- **التبرّع**: فقدان إضافي لجسيمات من مسطح حجري أملس.

**ملاحظات أخرى**:

يمكن أن يكون للتلفت أسباب طبيعية و/أ تكون بسبب الإنسانية. وقد يكون نتيجة عمليات كيميائية، فيزيائية أو/و بيولوجية.
**Differential erosion of a fossil bearing limestone block due to loss of matrix.**

**Malta, Valletta, old town, 2003. LRMH / V. Vergès-Belmin**

**Differential erosion in the sandstone Petra cliffs**

*Jordan, Petra, 2004. Photo 4–5m in height. LNEC / J. Delgado Rodrigues*

**Rounding of Serena sandstone due to preferential deterioration of edges close to the joints**

*France, Marseille, Cathédrale Nouvelle Major, 2006. Size of each block : 40x80cm. LRMH / V. Vergès-Belmin*

**Differential erosion on a marble sculpture visible after treatment with a biocide and gentle brushing.**

*Portugal, Queluz Palace, 2003. Width of the sculpture : ca. 60cm. LNEC / J. Delgado Rodrigues*

**The erosion of this limestone sculpture results in loss of carved details, and smoothed shapes.**

*France, Rouen, cathedral. LRMH / P. Bromblet*

**Loss of iron-rich component in a sandstone block.**

*Scotland, Edinburgh, Carlton Hill Observatory, 2007. LRMH / V. Vergès-Belmin*
Definition:
Loss of stone material clearly due to a mechanical action.

Equivalent terms to be found in other glossaries:

Sub-type(s):
- Impact damage: Mechanical damage due to the impact of a projectile (bullet, shrapnel) or of a hard tool.
- Cut: Loss of material due to the action of an edge tool. It can have the appearance of an excavated cavity, an incision, a missing edge, etc. Tool marks can be considered as special kinds of cuts but should not be considered as damage features.
- Scratch: Manually induced superficial and line-like loss of material due to the action of some pointed object. It can be accidental or intentional. Usually it appears as a more or less long groove. Tool marks can have the appearance of scratches, but should not be taken as damage features.
- Abrasion: Erosion due to wearing down or rubbing away by means of friction, or to the impact of particles.
- Keying: Impact damage resulting from hitting a surface with a pointed tool, in order to get an irregular surface which will assist the adhesion of an added material, a mortar for instance.

Other remarks:
In most cases mechanical damage has an anthropogenic origin.
Mechanical damage due to series of scratches on a limestone element.

France, Chartres, Cathédrale, 2005. LRMH / V. Vergès-Belmin

Impact damage on a limestone ashlar, due to a bullet.

Lebanon, Baalbek quarry, small building, 2000. LRMH / V. Vergès-Belmin

Soft limestone showing impact damage. These keying marks were made to facilitate the adhesion of a render, which was later removed or has fallen.

Malta, Valletta, 2006. LRMH / V. Vergès-Belmin

Cuts in a sandstone wall, most probably due to knife whetting.

Scotland, Stirling Castle, 2007. LRMH / V. Vergès-Belmin

The repeated abrasion effect of feet has led to the formation of a depression on this stone pavement element.

Italy, Tschars, South Tyrol, Pfarrkirche, 2001. IMP Uni., Innsbruck / C. Franzen
MICROKARST

Definition:
Network of small interconnected depressions of millimetric to centimetric scale, sometimes looking like hydrographic network. Microkarst patterns are due to a partial and/or selective dissolution of calcareous stone surfaces exposed to water run-off.

Equivalent terms to be found in other glossaries:
Karst, dissolution, cratering. This last term refers to bricks, not to stone.

Not to be confused with:
- Alveolization, the depressions of which are similar in shape but bigger in size (centimetric scale) and are not systematically interconnected. Alveolization may be due to selective degradation by salts, whereas microkarst is exclusively linked to an obvious dissolution process.
- Pitting: point like, usually not interconnected, millimetric or submillimetric cavities.

Other remarks:
There is no trace of any granular disintegration or scaling on the stone surface.

التعريف:
شبكة من الإخفاضات الصغيرة والمترابطة في الحجر تبلغ بضعة مليمترات أو سنتمترات، تبدو أحيانا مثل الشبكة الهيدروغرافية. وهذا النمط هو نتيجة إنحلال (ذوبان) جزئي أو إنتقائي لسطح الحجر الكلي المعرض للمياه.

مصطلحات مرادفة قد يتم ورودها في مسارد أخرى:
الجر، التفكك، التصيج. هذه الكلمة الأخيرة تشير إلى الخزائن، وليس الحجر.

يجب عدم الخلط مع مصطلح:
- تجوف سنخي، والتي تكون مشابهة في الشكل ولكنها ذات حجم أكبر وغير متصلة بشكل متناغم. التجوف السنخي قد يكون نتيجة التلف الإنتقائي بفعل الأملاح، بينما ترتبط ظاهرة التجعّد بعملية الألألاح.
- تجوف، يشبه النقاط، كجوازات بحجم بضعة مليمترات أو أقل. عادة غير مترابطة مع بعضها.

ملاحظات أخرى:
لا يوجد أي أثر للتفكك أو التجشير على سطح الحجر.
Microkarst developed on a limestone sculpture

Microkarst on a limestone sculpture

Turkey, Nemrud Dag 2002. Head of a statue (Apollo), Height of the image : c. 60 cm. Geol. Inst., Aachen University / B. Fitzner

Microkarst developed on the base of a chalk column particularly exposed to weather.

France, Amiens, Cathedral, western façade, 1992. LRMH / V. Vergès-Belmin
MISSING PART

Definition:
Empty space, obviously located in the place of some formerly existing stone part. Protruding and particularly exposed parts of sculptures (nose, fingers..) are typical locations for material loss resulting in missing parts.

Equivalent terms to be found in other glossaries:
Lacuna.

Subtype(s):
- Gap: hollow place in the stone surface, hole.
Chimney structure showing hole and loss of sandstone masonry.

هیكل مدخنة بها ثقب وفقدان جزء من البناء أثناء إنشان بالحجر الرملي.


The nose of this marble figure shows a missing part.

أنف هذا التمثال الرخامي يمثل الجزء المفقود

France, Versailles, Castle Park, Sculpted group "Le bain d'Apollon", 2004.LRMH / V. Vergès-Belmin
PERFORATION

Definition:
A single or series of surface punctures, holes or gaps, made by a sharp tool or created by an animal. The size is generally of millimetric to centimetric scale. Perforations are deeper than wide, and penetrate into the body of the stone.

Equivalent terms to be found in other glossaries:
Drill hole.

Not to be confused with:
- Pitting: formation of millimetric to submillimetric pits, usually much smaller than perforations.
- Gap: hole not obviously created through a perforation process.

Other remarks:
A perforation is normally induced by a sharp instrument (e.g., by drilling). In specific circumstances, animals may produce perforations:
- wasps on very soft stones (diameter: ca. 5 mm)
- marine molluscs (ex: lithophagus sp.) on stones which have stayed under water for some time (diameter: ca. 1 cm).
Perforation by marine lithophagous organisms on a limestone sphinx found during undersea excavations after an immersion of several centuries.

Egypt, Alexandria, Kom el Dikka open air museum, 2006. CICRP / P. Bromblet

Perforation due to wasps activity.

France, Avenay-Val-d’Or, Church St-Thérain, sandstone, 2006. Reims University / G. Fronteau

Geometrically organised perforations, forming letters of the word “farmacia”.

Italy, Venice, Istria stone, 2007. Diameter of the holes : 2mm. LRMH / V. Vergères-Belmin

Perforation of sandstone due to masonry bees which have entered the mortar joints and burrowed into the soft sandstone beneath the surface layer.

Definition:
Point-like millimetric or submillimetric shallow cavities. The pits generally have a cylindrical or conical shape and are not interconnected, although transitions patterns to interconnected pits can also be observed.

Equivalent terms to be found in other glossaries:
-}
Not to be confused with:
- Microkarst, which creates a network of small interconnected depressions of millimetric to centimetric scale.
- Perforation which is, in general, induced by a sharp instrument or an animal, and usually induces much bigger and deeper holes than pitting.

Other remarks:
Pitting is due to partial or selective deterioration. Pitting can be biogenically or chemically induced, especially on carbonate stones. Pitting may also result from a harsh or inadapted abrasive cleaning method.
Pitting developing on a marble sculpture. Microbiological origin is probable.

تنقّر موجود على منحوت رخامي من المحتمل أن يكون ذو أصل ميكروبيولوجي.

Germany, Munich, Old Southern cemetery, 1992. KDC Olching / S. Simon

Pitting, developing on the upper part of a broken limestone column. Microbiological origin is probable.

تنقّر موجود على الجزء العلوي من عمود مكسور من الحجر الجيري من المحتمل أن يكون ذو أصل ميكروبيولوجي.

Morocco, Volubilis archaeological site, 2006. Diameter of the column, c. 45 cm. CICRP / J.-M. Vallet

Pitting on an Istria limestone column. The black color of the stone is due to the presence of a black crust tracing its surface.

تنقّر موجود على عمود من الحجر الجيري "استريا"، ويرجع وجود اللون الأسود للحجر إلى وجود القشرة السوداء، التي تغطي على سطحه.

Italy, Venice, Doge’s Palace, 1998. LMRH / V. Vergès-Belmin

Pitting due to lichen colonization on a limestone block.

تنقّر بسبب استعمار الأسلات لكثمة من الحجر الجيري.

Lebanon, Baalbek temple, 2000. LRMH / V. Vergès-Belmin
CRUST
أديم، قشرة

Definition:
Generally coherent accumulation of materials on the surface. A crust may include exogenic deposits in combination with materials derived from the stone. A crust is frequently dark coloured (black crust) but light colours can also be found. Crusts may have an homogeneous thickness, and thus replicate the stone surface, or have irregular thickness and disturb the reading of the stone surface details.

Relationship with the substrate:
A crust may be weakly or strongly bonded to the substrate. Often, crusts detached from the substrate include stone material.

Sub-type(s):
- Black crust: Kind of crust developing generally on areas protected against direct rainfall or water runoff in urban environment. Black crusts usually adhere firmly to the substrate. They are composed mainly of particles from the atmosphere, trapped into a gypsum (CaSO4.2H2O) matrix.
- Salt crust: Crust composed of soluble salts, which develop in the presence of high salt levels, and form from wetting and drying cycles.

Not to be confused with:
- Encrustation, which is also a coherent layer, but is always adherent to the substrate. The term encrustation is preferred to crust when the accumulation clearly results from water infiltration followed by precipitation.
- Algae: Algae often have a dark colour during the dry season and may be confused with black crusts. Oppositely to black crusts, algae do not adhere to the substrate, and are usually located, in outdoors situations, in area exposed to direct rain impact, or on water pathways. These two characteristics differentiate algae from black crusts.
- Patina: Black iron rich patinas, which develop usually as a thin layer enriched in iron/clay minerals on iron containing sandstones, and are located on all exposed parts of the building/sculpture, not only on parts sheltered from the rain impact.

CRUST • أديم، قشرة
DEPOSIT • ترسب
DISCOLOURATION • تغيير اللون
EFFLORESCENCE • طفح ملحي
ENCRUNTATION • اكتساء قشري

Definition:
أديم، قشرة

تعريف:
ترسب على الطبقة السطحية تكوينات من الصخور تتخذ شكل قشرة ملساء أو هشة وتكون متراصبة من الجهة أو متشكلة من الجزء في معظم الأحيان تكون القشرة ذات اللون (قشرة سوداء، إلا أنها تكون أحيانًا لونًا نافعًا) اللون، قد يكون للقشور سماكة متغيرة، وذلك تبدو مثل سطح الحجر، وقد يكون لها سماكة غير منتظمة وذلك لا تسمح بدراسة تفاصيل سطح الحجر.

العلاقة مع الطبقة السفلية الأساسية:
قد تكون القشرة ملتصقة بشكل ضعيف أو بشكل قوي للطبقة السفلى. وفي أغلب الأحيان تحمل القشر المنفصلة معها بعض مواد الحجر.

أنواع فرعية:
- أديم أسود: القشرة السوداء، وهي نوع من القشر تتطور في الأماكن التي تكون محمية من هطول المطر المباشر أو من المياه الجارية في البيئة الحضرية. عادة تكون القشر السوداء متلاصقة جيدا مع الطبقة السفلى وهي أساسا مكونة من جسيمات تأتي من الجو ومعون داخل نسيج من الجص (CaSO₄·2H₂O).
- أديم ملح: قشرة ملحية: قشرة مكونة من الأملاح الذائبة، التي تتطور عند وجود مستويات عالية من الأملاح، ومن خلال دورات التبلل والتجفيف.

يجب عدم الخلط مع مصطلح:
- اكتساء قشري، و هي أيضًا طبقة متماسكة، وتكون دائمًا ملساء للطبقة السفلية، ويفضل استخدام هذا المصطلح عندما يكون تراكم الأذى نتيجة ترسب المواد الصلبة، ويمكن أن يتم اعتبارها أن تكون ثابتة. ويعكس الفصوص السوداء لا تتراكم لحالة بالطبقة السفلية، وعادة تكون موجودة في المواقع الخارجية ومسطح مرتفع للأثاث الحجري في سبيل ماء المطر.
- غشاء العتق: والأخضر الطيني: الذي يتطور لحالة بالطبقة السفلية، ويتوافق على جميع أجزاء المبنى أو المكونات المكونة وليس فقط في المناطق المحيطة من تأثير المطر.
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**Black crust** tracing the surface of a limestone sculpture. 
قدسية سوداء تغطي سطح النحت من الحجر الجيري.

*France, Saint-Denis, Basilique, 2006. Photo height : c. 30 cm. LRMH / V. Vergès-Belmin*

**Porous limestone, salt crust** (halite).
حجر جيري مسامي، قشرة ملح (الهاليت).

*Egypt, Cairo, Mosque, 2000. Stone width : c. 30 cm. Geol. Inst. / Aachen Univ. / B. Fitzner*

**Limestone Sculpture, black crust.**
منحوت من الحجر الجيري، أديم أسود.

*Germany, Naumburg, Cathedral, 1990. Head height : c. 30 cm. Geol. Inst. / Aachen Univ. / B. Fitzner*
**DEPOSIT**

**Definition:**
Accumulation of exogenic material of variable thickness. Some examples of deposits: splashes of paint or mortar, sea salt aerosols, atmospheric particles such as soot or dust, remains of conservation materials such as cellulose poultices, blast materials etc...

**Relationship with the substrate:**
A deposit generally lacks adhesion to the stone surface.

**Equivalent terms to be found in other glossaries:**
Surface deposit.

**Not to be confused with:**
Bird and bat droppings are considered as deposits, whereas bird nests, spider webs are to be considered as biological colonization.

**Other remarks:**
A deposit can be described for colour, morphology, size and if possible nature and/or origin.
Deposit of pigeon droppings on granite sculpture

تربّس فضلات الحمام على منحوتة من الجرانيت.


The material detached from the sandstone block forms a deposit.

هذه المواد المنفصلة عن كتلة الحجر الرملي تشكل الترسّبات.

USA, Santa Barbara, Mission, 2008. Block height : 30 cm. Véronique Vergès-Belmin / LRMH
**Definition:**
Change of the stone colour in one to three of the colour parameters: hue, value and chroma.

- hue corresponds to the most prominent characteristic of a colour (blue, red, yellow, orange etc.).
- value corresponds to the darkness (low hues) or lightness (high hues) of a colour.
- chroma corresponds to the purity of a colour.

High chroma colours look rich and full. Low chroma colours look dull and grayish. Sometimes chroma is called saturation.

**Relation with the substrate:**
It may affect the surface and/or be present in depth of the stone.

**Equivalent terms to be found in other glossaries:**
Chromatic alteration.

**Other spelling:**
Discoloration (US).

**Sub-type(s):**
- Colouration (to be preferred to colouring): change in hue, value and/or a gain in chroma
- Bleaching (or fading): gain in value due to chemical weathering of minerals (e.g. reduction of iron and manganese compounds) or extraction of coloring matter (teaching, washing out), or loss of polish, generally very superficial. Dark and bright color marbles often show bleaching as a result of exposure to weather.
- Moist area: corresponds to the darkening (lower hue) of a surface due to dampness. The denomination moist area is preferred to moist spot, moist zone or visible damp area.
- Staining: kind of discoloration of limited extent and generally of unattractive appearance.

**Not to be confused with:**
- Patina: superficial modification of the material perceivable as a discolouration, in often having a favourable connotation.
- Soiling: refers to a tangible deposit and has a negative connotation.
- Deposit: refers to the accumulation of material of variable thickness, possibly having a color different from that of the stone.

**Other remarks:**
Discolouration is frequently produced by salts, by the corrosion of metals (e.g. iron, lead, copper) by micro-organisms, or by exposure to fire.

Some typical yellow, orange, brown and black discoloration patterns are due to the presence of carotenoids and melanins produced by fungi and cyanobacteria.

Darkened areas due to moistening may have different shapes and extension according to their origin: pipe leakage, rising damp, hygroscopic behaviour due to the presence of salts, condensation.

**Other terms:**
- Coloration (to be preferred to colouring)
- Bleaching (or fading)
- Moist area
- Staining
- Patina
- Soiling
- Deposit

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- Patina
- Soiling
- Deposit

**Relationship with the substrate:**
It may affect the surface and/or be present in depth of the stone.

**Equivalent terms to be found in other glossaries:**
Chromatic alteration.

**Other spelling:**
Discoloration (US).

**Sub-type(s):**
- Colouration (to be preferred to colouring): change in hue, value and/or a gain in chroma
- Bleaching (or fading): gain in value due to chemical weathering of minerals (e.g. reduction of iron and manganese compounds) or extraction of coloring matter (teaching, washing out), or loss of polish, generally very superficial. Dark and bright color marbles often show bleaching as a result of exposure to weather.
- Moist area: corresponds to the darkening (lower hue) of a surface due to dampness. The denomination moist area is preferred to moist spot, moist zone or visible damp area.
- Staining: kind of discolouration of limited extent and generally of unattractive appearance.

**Not to be confused with:**
- Patina: superficial modification of the material perceivable as a discolouration, in often having a favourable connotation.
- Soiling: refers to a tangible deposit and has a negative connotation.
- Deposit: refers to the accumulation of material of variable thickness, possibly having a color different from that of the stone.

**Other remarks:**
Discolouration is frequently produced by salts, by the corrosion of metals (e.g. iron, lead, copper) by micro-organisms, or by exposure to fire.

Some typical yellow, orange, brown and black discoloration patterns are due to the presence of carotenoids and melanins produced by fungi and cyanobacteria.

Darkened areas due to moistening may have different shapes and extension according to their origin: pipe leakage, rising damp, hygroscopic behaviour due to the presence of salts, condensation.

**Other terms:**
- Coloration (to be preferred to colouring)
- Bleaching (or fading)
- Moist area
- Staining
- Patina
- Soiling
- Deposit

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It may affect the surface and/or be present in depth of the stone.

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Darkened areas due to moistening may have different shapes and extension according to their origin: pipe leakage, rising damp, hygroscopic behaviour due to the presence of salts, condensation.
Iron oxides are driven by water from the rusting railing, and induce the development of a brown staining on the underlying stones.

أكاسيد الحديد التي تحملها الماء تتسبب في ازهار بني على حجارة الأساس

Stains on a limestone pediment underneath a bronze sculpture.

يقع على قوصرة من الحجر الجيري تحت تمثال من البرونز

Staining from water absorption or vapor condensation occurring on marble cladding.

تبقى نتيجة امتصاص الماء أو بخار التكيف التي تظهر في التكسية الرخامية

ICOMOS International Scientific Committee for Stone (ISCS).

اللجنة العلمية الدولية للحجارة
Definition:
Generally whitish, powdery or whisker-like crystals on the surface. Efflorescences are generally poorly cohesive and commonly made of soluble salt crystals.

Relationship with the substrate:
Efflorescences are generally poorly bonded to the stone surface.

Equivalent terms to be found in other glossaries:
Efflorescence is preferred to the expression loose salt deposits.

Not to be confused with:
- Subflorences: Term employed in the case where crystallization occurs inside the material.
- Deposit: To the naked eye, efflorescences often look like deposits. However, their constituents come from the stone itself whereas deposits come from outside.

Other remarks:
Efflorescence is commonly the result of evaporation of saline water present in the porous structure of the stone. Efflorescences are often constituted of soluble salts such as sodium chloride (halite: NaCl) or sulphate (thenardite: Na2SO4), magnesium sulphate (epsomite: MgSO4·7H2O), but they may also be made of less soluble minerals such as calcite (CaCO3), barium sulphate (BaSO4) and amorphous silica (SiO2·nH2O).

English-Arabic Dictionary:
- "Definition" 
- "Relationship with the substrate" 
- "Equivalent terms to be found in other glossaries" 
- "Not to be confused with" 
- "Other remarks"
Efflorescence on dolomitic limestone related to historic air pollution.

Formation of salts forming efflorescence on the surface of sandstone masonry, focused at joints between masonry blocks.

Limestone block showing salt efflorescences.

**EFFLORESCENCE**

**FILM**

**GLOSSY ASPECT**

**GRAFFITI**

**PATINA**

**SOILING**

**SUBFLORESCENCE**
** Definition:**
Compact, hard, mineral outer layer adhering to the stone. Surface morphology and colour are usually different from those of the stone.

**Relationship with the substrate:**
Encrustations generally adhere firmly to the stone surface. When an encrustation is removed, adhering stone materials may be taken away with it.

**Location:**
Encrustations are generally found below areas of the building where water is percolating or has percolated in the past.

**Equivalent terms to be found in other glossaries:**
Incrustation.

**Sub-type(s):**
- **Concretion:** Kind of encrustation having a specific shape: nodular, botryoidal (grape-like) or framboidal (raspberry like). Concretions may even have conic shapes of form drapery-like vertical sheets. Stalagmites and stalactites are kinds of concretions. In general, concretions do not outline, contour the surface of the stone, and are of limited extent.

**Not to be confused with:**
- **Crust:** The term encrustation is used when the feature is clearly due to a precipitation process, following any kind of leaching. If there is no evidence of leaching and precipitation, the term crust will be employed.
- **Lichen:** Some lichens (the so-called crustose ones) can look like encrustations. Lichens are not usually hard. When scratched, one can see blackish or green traces resulting from algae or cyanobacteria hosted by the lichen.

**Other remarks:**
Encrustations on monuments are frequently deposits of materials mobilized by water percolation and thus coming from the building itself: Carbonates, sulphates, metallic oxides and silica are frequently found.
Calcite encrustation covering a limestone masonry under an arch.

France, Vaison-la-Romaine, ancient cathedral Notre-Dame de Nazareth, cloister, 2005. CICRP / P. Bromblet

Concretions with the form of stalactites under the arch of the aqueduct built of limestone.

Portugal, Lisbon, Águas Livres Aqueduct 2002. Blocks are c. 1m wide. LNEC / J. Delgado Rodrigues

Calcite encrustation linked to water leached from joints, on a granite, sandstone and schist ashlar.

Scotland, Isle of Iona, ancient convent (detail), 2006. Length of a stone, c. 25 cm. CICRP / J.M. Vallet

ENCRUSTATION

Calcite encrustation

ENCRUSTATION

Concretions

PATINA • غشاء العنق

SOILING • اوساخ

SUBFLORESCENCE • تزهر
**Definition:**
Thin covering or coating layer generally of organic nature, generally homogeneous, follows the stone surface. A film may be opaque or translucent.

**Relationship with the substrate:**
A film is generally adhering to but not penetrating into the substrate, possibly changing surface properties (aspect, colour, permeability) of the stone.

**Equivalent terms to be found in other glossaries:**
Pellicle, skin.

**Not to be confused with:**
- Patina, which, to the naked eye, has no perceivable thickness.
- Encrustation, which refers to a strongly adhering mineral deposit, and may not follow the surface of the stone as a film would.

**Other remarks:**
Paint layers, certain categories of water repellents or protective agents (antigraffitis), sealants, are considered films. A biofilm is a kind of biological colonization (see this term). Through ageing, a film may loose its translucency or detach from the substrate.

**مصطلحات مرادفة قد يتم ورودها في مسارد أخرى:**
لمحة عامة ومن العبارات الممكنة بالعين:
- غشاء النكة (باتينا) والذي ليس له سماكة يمكن ملاحظتها بالعين المجردة.
- اكتساء قشري والذي يشير إلى ترسبات معدنية تحترف في السطح، وقد لا تتبع سطح الحجر كما يفعل غشاء.
Porous limestone ashlar partially covered with multilayer paint film.

حجر بناء مربع مسامي من أصل جيري مغطى بغشاء لوني متعدد الطبقات.
<table>
<thead>
<tr>
<th>DISCOLOURATION &amp; DEPOSIT</th>
<th>CRUST •</th>
<th>DEPOSIT •</th>
<th>DISCOLOURATION •</th>
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<tr>
<td>Tغيير اللون والترسبات</td>
<td>أديم،قشرة</td>
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<td>طفح ملحی</td>
<td>اكتساء قشري</td>
</tr>
</tbody>
</table>

**GLOSSY ASPECT**

**Definition:**
Aspect of a surface that reflects totally or partially the light. The surface has a mirror-like appearance.

**Equivalent terms to be found in other glossaries:**
Polished surface.

**Other remarks:**
A glossy aspect may be due to previous polishing (intentional or not), or to the presence of a transparent film which reflects light.

**التعريف:**
جانب من السطح يعكس الضوء بشكل كلي أو جزئي. يكون للسطح مظهر يشبه المرآة.

مصطلحات مرادفة قد يتم ورودها في مسارد أخرى:
سطح مصقول.

ملاحظات أخرى:
قد يكون الجانب المصقول نتيجة صقل تم في السابق (قد يكون عن قصد أو دون قصد) أو نتيجة وجود غشاء شفاف يعكس الضوء.
Marble column, covered with a superficial film of polyvinyl acetate. This product was applied during a restoration campaign, to give back the marble its original glossy aspect.


The glossy aspect of this parapet is due to the repeated rubbing action of people leaning over the bridge.

Italy, Venice, Rialto Bridge, 1994. LRMH / V. Vergès-Belmin

Glossy aspect on pavement stones

Malta, Valletta, 2004. LRMH / V. Vergès-Belmin
**GRAFFITI**

**Definition:**
Engraving, scratching, cutting or application of paint, ink or similar matter on the stone surface.

**Other spelling:**
Plural: Graffitis.

**Other remarks:**
Graffitis are generally the result of an act of vandalism. However, some graffitis may have historical, aesthetical or cultural values and should be conserved.

التعريف:
حرق، خدش، قطع أو استخدام الدهان، الحبر أو مواد أخرى مشابهة على سطح الحجر.

ملاحظات أخرى:
الخربشات هي عادة نتيجة عمل تخريبي. إلا أنها في بعض الأحيان تكون ذات قيمة تاريخية، أو جمالية أو ثقافية، وفي تلك الحالات يجب الحفاظ عليها.
Marble sculpture of the Potsdam park coloured by a graffiti.

تمثال نصفي رخامي من حديقة بوتسدام ملون بخربشات.

Germany, Potsdam castle, LRMH / V. Vergès-Belmin

Graffiti in the west abutment of the Aqueduct built in limestone.

خريشة "كتابات بالألوان" على دعامة مجرى مائي مرفوع بنيت بالحجر الجيري.

Portugal, Lisbon, Águas Livres Aqueduct, 2005. "Alex" spreads on c. 1m. LNEC / J. Delgado Rodrigues

Graffiti obtained through scratching.

الحصول على خريشات من خلال الخدش.

Malta, Valletta, 2006. Porous limestone, LRMH / V. Vergès-Belmin
Definition: Chromatic modification of the material, generally resulting from natural or artificial ageing and not involving in most cases visible surface deterioration.

Sub-type(s):
- Iron rich patina: Natural black to brown thin layer enriched in iron/clay minerals, which can be found on iron containing sandstones. This kind of patina is generally observed in outdoors environment, and develops quite uniformly on the stone surface.
- Oxalate patina: Orange to brown thin layer enriched in calcium oxalates. This kind of patina may be found in outdoors environment, often on marble and limestone substrates.

Not to be confused with:
- Film, which is a thin visible homogeneous covering or coating layer generally of organic nature.
- Black crust, which is a generally coherent accumulation of materials on the surface. Black crusts are black to grey and have a perceivable thickness.
- Discolouration, which is a change of colour perceived as unattractive.
Oxalate patina developing on limestone.

The sandstone elements of these buttresses show a variety of colours. Creamy to orange colours 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 exposure in the open air.

This sandstone sculpture, originally of light colour, has developed an iron rich patina over time.

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<p>This sandstone sculpture, originally of light colour, has developed an iron rich patina over time.</p>
SOILING
اوساخ

Definition:
Deposit of a very thin layer of exogenous particles (eg. soot) giving a dirty appearance to the stone surface.

Relationship with the substrate:
With soiling, the substrate structure is not considered as affected. Soiling may have different degrees of adhesion to the substrate.

Equivalent terms in other glossaries:
- Crust, which has a visible thickness.
- Deposit, which has a visible thickness, and not systematically a dirty appearance.

Not to be confused with:
- Crust, which has a visible thickness.
- Deposit, which has a visible thickness, and not systematically a dirty appearance.

Other remarks:
With increasing adhesion and cohesion, soiling can transform into a crust. Soiling may originate from atmospheric pollutants (industrial, domestic or car exhaust products) or from particles transported by running water or heating convection.
This very particular type of soiling is specific of stone surfaces treated with water repellents. Water pathways are limited to narrow stripes, where algae may develop preferentially.

هذا النوع الخاص من الأوساخ يختص بالأسطح الحجرية المعالَجة ببخار الماء حيث أن مسارات الماء تقتصر على مسالك ضيقة، أي تشكل وسطاً ملائماً لنمو الطحالب.

France, Versailles, Castle Park, marble sculpture, 2002. Large side: c. 0.6 m. LRMH / V. Vergès-Belmin

Thin, veil-like soiling by atmospheric dust on horizontal and subhorizontal parts of the sculptures.

أوساخ رقيقة و مُحتجَبة بسبب تلوث الغبار في الغلاف الجوي على الأجزاء الأفقية وشبه الأفقية من المنحوتات.

France, Marseille, La Nouvelle Major cathedral, Grey Serena sandstone and white limestone, 2006. Size of the tympanum: c. 2.5 m. CICRP / J.-M. Vallet

Soiling at the surface of a limestone sculpture protected against rainfall.

أوساخ على سطح تمثال من الحجر الجيري محمي من مياه الأمطار.

**Definition:**
Poorly adhesive soluble salts, commonly white, located under the stone surface.

**Relationship with the substrate:**
Subflorescences are hidden, unless the stone layer over them detaches. In that case, salt crystals become visible on the newly exposed surface.

**Equivalent terms to be found in other glossaries:**
Cryptoflorescence.

**Not to be confused with:**
- Efflorescence, which corresponds to salt crystallization on the stone surface of the stone instead of under it.

**Other remarks:**
Subflorescence is commonly the result of evaporation of saline water present in the porous structure of the stone. As subflorescences develop inside the porous structure, they often result in scaling of the surface.

**التعريف:**
وجود أملاح ذائبة، عادة بيضاء اللون، تحت سطح الحجر.

**العلاقة مع الطبقة السفلي:**
التزهّر تكون غير ظاهرة إلا إذا تم إنفصال طبقة الحجر التي تعلوه. وفي هذه الحالة تصبح بلورات الملح ظاهرة على السطح الذي تم كشفه حديثا.

**مصطلحات مرادفة قد يتم ورودها في مسارد أخرى:**
الأملاح الخفية

**يجب عدم الخلط مع:**
- طفح ملحي، والذي يمثل تبلور الأملاح على سطح الحجر بدلاً من أسفله.

**ملاحظات أخرى:**
التزهّر عادة تكون نتيجة تبخر الماء المالحة الموجودة في الهيكل المسامي للحجر. وقد يطور التزهّر داخل الجسم المسامي وفي أغلب الأحيان ينتج عنه تنشر السطح.
Formation of white **subflorescence**, i.e. salt deposits within porous sandstone leading to loss of the stone surface, resulting from the use of de-icing salts at the entrance to the building.

تشكل التزهّر الأبيض، أي ترسبات الملح داخل حجررملي مسامي مما يؤدي إلى فقدان سطح الحجر، والنتيجة عن استخدام أملاح إزالة الجليد عند مدخل المبنى.

**Definition:**
Colonization of the stone by plants and microorganisms such as bacteria, cyanobacteria, algae, fungi and lichen (symbioses of the latter three). Biological colonization also includes influences by other organisms such as animals nesting on and in stone.

**Relationship with the substrate:**
Direct growth on and in stone or stone cavities; also indirect influences by nearby trees and other organisms.

**Equivalent terms to be found in other glossaries:**
Biological growth, biological overgrowth, living exogenous material.

**Other spelling:**
Biological colonisation.

**Not to be confused with:**
- Deposit: consists of an accumulation of exogenic material, such as dust, droppings, on the stone surface. For instance, a bird nest, a spider web are part of biological colonization, but bird or bat droppings are deposits.

**Other remarks:**
Biological colonization may be used when a mixture of different types of organisms are present on a stone, and are not distinguishable from each other.

Biofilm: Mono- to multilayered microbial colony attached to surfaces with varying thickness of up to 2mm. 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. Biofilms often create multicoloured bioapatina by production of colouring agents. Higher plants grow sometimes to a considerable size at unexpected locations.

**التعريف:**
استيطان للحجر من قبل نبات أو كائنات مجهزية مثل البكتيريا، البكتيريا الزرقاء، الطحالب، الفطريات، والحزاز (تكافل الأنواع الثلاثة). الإستيطان البيولوجي يعتبر أيضًا تأثير كائنات أخرى مثل الحيوانات التي تعيش في وعلى الحجر.

**العلاقة مع الطبقة السفلى:**
هو مباشرة وعلى الحجر أو فجوات الحجر؛ التأثير المباشر من قبل الأشجار القريبة والكائنات الأخرى.

**مصطلحات مرادفة قد يتم ورودها في مسارد أخرى:**
نمو بيولوجي، نمو بيولوجي سريع، مواد حية خارجية - ترسب: يتكون من تراكم مواد خارجية مثل الغبار أو مخلفات الطيور على الحجر؛ على سبيل المثال إن عش العصافير وشبكة عنكبوت هما أنواع من التجمع البيولوجي، بينما تعتبر مخلفات الطيور والوطاويط كترسبات.

**ملاحظات أخرى:**
يمكن استخدام مصطلح الإستيطان البيولوجي عند وجود أنواع مختلفة من الكائنات على الحجر في نفس الوقت، حيث يصعب التمييز فيما بينها.

**غشاء بيولوجي:** إستيطان ميكرو بيولوجي مكون من طبقة أو عدة طبقات منفصلة مع الحجر وعند سماكتهم تصل إلى 2 مم. في معظم الأحيان يكون الغشاء البيولوجي من بضعة خليات كائنات مجهرية خليطية تكون جزءًا ناتجًا من إنتاج الأحياء للجرة الخفية، وهذه الطبقات متداخلة وغير متصلة، ويمكن أن تكون استضافًا للأحياء البيئية في معظم الأحيان خليط من إنتاج مجموعة من الخلايا المكونة.

**أخيرًا:**
ننمو النباتات بحجم بالغ في أماكن غير متوقعة.
This mason wasp nest on a sandstone carved element constitutes a type of biological colonization.

India, Fatehpur Sikri, 2003. LRMH / V. Vergès-Belmin

Biological colonization constituted of an association of algae (dark grey), lichen (light grey and orange) and mosses (green cushions, 2cm large).

France, Bourges, Cathedral, limestone bank, 2007. LRMH / V. Vergès-Belmin

Biological colonization (essentially plants and algae) on a limestone masonry.

Malta, Mdina, gate of the old fortified capital, 2005. IMCR / J. Cassar

Dark grey diffuse biological colonization in dolostone and limestone.

Portugal, Tomar, Christ Convent, 2001. Photo of 10m width approximately. LNEC / J. Delgado Rodrigues
Definition:
Algae are microscopic vegetal organisms without stem nor leaves which can be seen outdoors and indoors, as powdery or viscous deposits (thickness: tenth of mm to several mm). Algae form green, red, brown, or black veil like zones and can be found mainly in situations where the substrate remains moistened for long periods of time. Depending on the environmental conditions and substrate type, algae may form solid layers or smooth films. On monuments, algae are constituted of unicellular to pluricellular clusters, and they never form macroorganisms.

Relationship with the substrate:
Algae generally constitute superficial films. They may be found also deeper into the substrate (under scales, in cracks).

Other orthograph:
Plural form: algae.

Not to be confused with:
Algae may be confused with epilithic lichen, with fungae and sometimes with soot or mineral deposits soiling the stone surface. If algae are present, wetting and brushing the surface will turn it to green due to the presence of chlorophyll.

Other remarks:
Several groups of algae may grow on and in stone depending on climate and stone type. Green algae (sometimes red, e.g. trentepohlia) diatoms (usually yellow to brown), and in rare cases red algae may occur. Cyanobacteria (formerly called blue-green algae) are very frequent stone dwellers and can cause black, bluish or even violet stains. In some cases the stone serves as a source of nutrients. However usually the stone surface is only a solid host for growth.

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Several groups of algae may grow on and in stone depending on climate and stone type. Green algae (sometimes red, e.g. trentepohlia) diatoms (usually yellow to brown), and in rare cases red algae may occur. Cyanobacteria (formerly called blue-green algae) are very frequent stone dwellers and can cause black, bluish or even violet stains. In some cases the stone serves as a source of nutrients. However usually the stone surface is only a solid host for growth.

ملاحظات أخرى:
هناك عدة جماعات من الطحالب التي قد تنمو على وداخل الحجر حسب الأنواع الجوية ونوع الحجر. وقد تظهر الطحالب الخضراء (أحيانا الحمراء، مثلا Trentepohlia diatoms (الأخضراء، بنية، في حالات تناهد الطحالب الحمراء) وتكوينًا زمنيًا على سطح الحجر. وقد تنتج بلعس جدران الحجر. وقد تنتج بلعس جدران الحجر. وقد تنتج بلعس جدران الحجر. وقد تنتج بلعس جدران الحجر. وقد تنتج بلعس جدران الحجر. وقد تنتج بلعس جدران الحجر. وقد تنتج بلعس جدران الحجر. وقد تنتج بلعس جدران الحجر. وقد تنتج بلعس جدران الحجر. وقد تنتج بلعس جدران الحجر. وقد تنتج بلعس جدران الحجر. وقد تنتج بلعس جدران الحجر. وقد تنتج بلعس جدران الحجر. وقد تنتج بلعس جدران الحجر. وقد تنتج بلعس جدران الحجر. وقد تنتج بلعس جدران الحجر. وقد تنتج بلعس جدران الحجر. وقد تنتج بلعس جدران الحجر. وقد تنتج بلعس جدران الحجر. وقد تنتج بلعس جدران الحجر. وقد تنتج بلعس جدران الحجر. وقد تنتج بلعس جدران الحجر. وقد تنتج بلعس جدران الحجر. وقد تنتج بلعس جدران الحجر. وقد تنتج بلعس جدران الحجر. وقد تنتج بلعس جدران الحجر. وقد تنتج بلعس جدران الحجر. وقد تنتج بلعس جدران الحجر. وقد تنتج بلعس جدران الحجر. وقد تنتج بلعس جدران الحجر. وقد تنتج بلعس
Green algae growing on a limestone buttress. طحالب خضراء نامية على دعامة من الحجر الجيري.

France, Thouars, Église Saint-Médard, 1994. Dimension stones 30 cm thick. LRMH / G. Orial

Red algae on a bas-relief sandstone sculpture. طحالب حمراء على نحت غائر من الحجر الرملي.

Cambodia, Angkor, Chao Sey, 2003. LRMH / V. Vergès-Belmin

Green algae developing on a lime render on stone masonry. طحالب خضراء نامية على طلاء جيري لحجربناء.

**LICHEN**

**Definition:**
Vegetal organism forming rounded millimetric to centimetric crusty or bushy patches, often having a leathery appearance, growing generally on outside parts of a building. Lichen are most commonly grey, yellow, orange, green or black and show no differentiation into stem, root and leaf.

**Relationship with the substrate:**
A lichen is composed of a thallus, eventually bearing fruiting bodies, generally developed on the stone surface, and rhizines that may penetrate deep into the stone (tens to several millimeters).

**Sub-type(s):**
Lichen usually are divided into crustose, folious and epilithic types. When their thallus is mainly inside the stone, they are called endolithic lichen.

**Not to be confused with:**
Moss, alga, mould : see those terms.

**Other remarks:**
All lichen represent symbiotic growth of a fungus and green alga or a cyanobacterium. Lichen is a common feature on outdoor stone 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 or agriculture. Former lichen growth may be detected by typical pitting structures (see this term) or lobate or mosaic patterns and even depressions.
Lichens on a marble figure.

Switzerland, Pontresina, Cemetery, 1993. KDC Olching/S. Simon

Lichen on marble sculpture.

Portugal, Évora, Cathedral, 2001. Pieces of 1.5m height approximately. LNEC / J. Delgado Rodrigues

Lichen on a coarse grained granite monolith.

Portugal, Évora, Almendres Cromlech, 2004. Monolith 2m high approximately. LNEC / J. Delgado Rodrigues

Folious lichen (Ramalina sp.) growing on a granite dimension stone.


White folious lichen on a basaltic Tiki

French Polynesia, Marquesas Islands, Atuona, 2006. LRMH / G. Orial
MOSS

Definition:
Vegetal organism forming small, soft and green cushions of centimetric size. Mosses look generally like dense micro-leaves (sub- to millimetric size) tightly packed together. Mosses often grow on stone surface open cavities, cracks, and in any place permanently or frequently wet (masonry joints), and usually shady.

Relationship with the substrate:
Mosses develop brown rhizines and may create a micro-soil zone between the stone surface and the green part.

Not to be confused with:
- Lichen, which are composed of a thallus and do not have the typical organisation of micro-leaves tightly packed together.
- Algae: Algae are green during the humid season, but look different from mosses (viscous consistency, absence of microleaves).

Other remarks:
Mosses often change morphology and colour under lack or excess of water. During dry periods of the year, the cushions shrink, become harder and brittle, and their colour turns to brown.

التعريف:
كائنات نباتية تشكل وسادات طرية وخضراء اللون بحجم بضعة سنتمترات. ويشبه مظهرها أوراق نباتية كثيفة وصغيرة الحجم (بحجم أقل من بضعة مليمترات) مرزمة مع بعضها بإحكام. تنمو الطحالب غالبا في الفجوات الموجودة على سطح الحجر أو في المضوع أو في أي مكان يكون رطبا بشكل دائم أو بشكل مستمر (مثل وحلات الجدران المبنية) وعادة التي تكون مظللة.

الملاحظات الأخرى:
عادة يتم تشكل جذور بنية اللون وقد تنتج طبقة تربة ضخيرة جدا بين سطح الحجر والبقعة الطحالب الخضراء.

لا يجب الخلط مع مصطلح:
- الأشنات، التي تتألف من مجسمات نباتية عديمة المحور وليس لها التنظيم المموذي ذو الأوراق النباتية الصغيرة الحجم المرزمة مع بعضها بإحكام.
- الطحالب، وهي خضرة اللون خلال المواسم الرطبة، إلا أن مظهرها يختلف عن الحزاز (زجاجة، وليس لها أوراق صغيرة).

علاقه مع الطبقة السفلية:
عادة يتم تشكل جذور بنية اللون وقد تنتج طبقة تربة ضخيرة جدا بين سطح الحجر والبقعة الطحالب الخضراء.

علاقه مع الطبقة السفلية:
- شائعة الشكل ولون الحزاز في حال عدم وجود الماء بشكل فاصل، خلال فترات الجفاف، تتكشف الوسائد وتصبح أكثر قساوة وتحمل لونا أنيبيا.
Different kinds of mosses developed on sandstone.

أنواع مختلفة من الحزاز نامية على حجررم.

Sweden, Stockholm. Skanska / M. Klingspor-Rotstein

Chalk sculpture, showing mosses, which appear brownish (typical aspect during the dry season), and are developed on the upper part of the figure.

نحت طباشيري يُظهِر الحزاز، ويبدوُ بنّياً (الجانب نموذجي خلال موسم الجفاف ) يتوضع على الجزء العلوي لهذا النحت.

LRMH / V. Vergès-Belmin

Moss on the joints of a granite ashlar.

حزاز على مفاصل لحجر بناء مربع الجرانيت.

Definition: Microscopic fungus which colonies, to the naked eye, look like a downy film or a network or star-like millimetric patches of filaments of diverse colours (white, grey, black).

Relationship with the substrate: Moulds, by their filamentous and/or chain-like growth may penetrate several centimeters into the stone substrate.

Equivalent terms to be found in other glossaries: Fungi.

Other spelling: Mold (US)

Not to be confused with:
- Algae, which form powdery or viscous layers and are only found in areas which remain humid for long periods of time.
- Lichen, which form generally crusty to bushy patches. Lichen coverings are thicker than mould coverings.
- Salt efflorescences, and initial stages of calcite encrustations, which are both mineral features.

Other remarks: Mould often create serious damage by chemical and mechanical action and heavy discolouration. As the metabolism of mould necessitates organic substrates mould often develops on algal metabolic products found on stone. Organic pollution of the atmosphere also favours mould growth.

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 outros termos que podem ser encontrados em outros glosários: Fungi.

Outras escritas: Mold (US)

Não confundir com:
- Algues, que formam camadas de pó ou viscosas e apenas se encontram em áreas que permanecem úmida por longos períodos de tempo.
- Lichens, que formam geralmente camadas crustáceas ou peludas. As coberturas de lichens são mais espessas do que as coberturas de fungos.
- Manchas salinas e estágios iniciais de encrustações de calcita, que são características mineralógicas.

Outras informações:
Moldes frequentemente causam sérios danos por ação química e mecânica e descoloração profunda. Como o metabolismo de moldes necessita de substratos orgânicos, o desenvolvimento de moldes frequentemente ocorre em produtos metabólicos alginéticos encontrados no stone. A poluição orgânica do ambiente também favorece o crescimento de moldes.

nombre propios: Fungi.

Términos equivalentes que pueden encontrarse en otros glosarios: Fungi.

Otras escrituras: Mold (US)

No confundir con:
- Algas, que forman capas de polvo o viscosas y solo se encuentran en áreas que permanecen húmedas por largos períodos de tiempo.
- Lichenes, que forman generalmente parches crustáceos o peludos. Las cubiertas de lichenes son más espesas que las cubiertas de hongos.
- Manchas salares y etapas iniciales de encrustaciones de calcita, que son características minerales.

Otras observaciones:
Los moldes a menudo crean daños graves a través de acción química y mecánica y una descoloración pesada. Como el metabolismo de los moldes necesitan de substratos orgánicos, a menudo desarrollan en productos metabólicos algínicos encontrados en stone. La contaminación orgánica del ambiente también favorece el crecimiento de moldes.
Down-like white moulds on a limestone block.

عفن أبيض على شكل الزغب على كتلة من الحجر الجيري.

France, les salles Lavauguyon, Sainte- Eutrope church, 2008. Photo large side : 40cm. / V. Legoux
**Definition:**
Vegetal living being, having, when complete, root, stem, and leaves, though consisting sometimes only of a single leafy expansion (e.g. Tree, fern, herb).

**Equivalent terms to be found in other glossaries:**
Higher plant, vegetation.

**Other remarks:**
If buildings are not maintained, plants will eventually colonise places where water is accessible, extending roots into joints and fractures. As the roots grow they can widen these joints and cracks and break the stone. They may also contribute to keep areas damp. This in turn, exacerbates other processes such as salt deterioration.

**Definition:**
نبات حي، عند إكتماله يكون له جذور، وجذع، وأوراق، وفي بعض الأحيان قد يشتمل فقط على تمدد نباتي فردي (مثل شجرة، عشب).

**مصطلحات مرادفة قد يتم ورودها في مسارد أخرى:**
نبات مسلطة.

**ملاحظات أخرى:**
يتم إنتشار النبات عند وجود المياه نتيجة عدم صيانة المباني، وعند جذورها داخل الصدوع والتمزقات. وقد يؤدي نمو الجذور الى توسع هذه الصدوع وتكرس الحجر. وقد تسهم النباتات أيضا في إبقاء الرطوبة في بعض الأماكن، مما قد يفاقم عمليات أخرى مثل التلف الناتج عن وجود الأملاح.
Higher plant (tetraeles nedifera) growing on a temple.

شجرة متسلقة (تين البنغال) نامية على معبد.

Cambodia, Angkor, Chao Sey, 2003. ICBM / W. Krumbein

Plants growing on sandstone basalt masonry

نباتات نامية على مبنى من البازلت والحجر الرملي.


Higher plant (Fig tree) growing on a roof

شجرة متسلقة (شجرة تين) نامية على سطح مبنى.

France, Capestang (Aude), Castle (roof), 2005. Length of a stone, c. 35 cm. CICRP / J.M. Vallet
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