Salti del Diavolo

Conglomerate and Sandstone on the Parmesan Apennines

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CHIASTRE DI RAVARANO

Chiastre is a small village located on the slopes of the Baganza Valley, in the province of Parma, Emilia Romagna. The story of this place, from its origin on, is strictly connected to the surrounding natural landscape. The name "Chiastre" comes from the dialect "Ciàstra", that means stone.
The village erects directly from the rock and seems a continuation of it, for it is made of the same material. This otherwise unknown place has grown up on the stone and thanks to it. In the past, it used to be the motherland of the most qualified stonemasons of the Valley and, moreover, it was known for its being dominated by high rock peaks which inspired the fantasy of the inhabitants, who named them the "Devil's Jumps".
The legend tells that the Devil tried to tempt an hermit who was retired in solitude on an existing cave, the Chiastra di San Benedetto, next to the Via Francigena, used also as hiding place by the partisans during the II World War. When the hermit finally managed to drive away Lucifer, the tempter scratched and shaped the rocks where, from there on, no vegetation could grow.

SALTI DEL DIAVOLO

This particular area in the parmesan province represents an interesting geo-site for the outcrop of sedimentary formations formed during the Cretaceous age on the African edge of Ligurian Ocean.

The conglomerates ad sandstones of Salti del Diavolo present themselves as a 5 kilometres ridge which extends in direction NW-SE along the Baganza Valley, crossing almost perpendicular the Baganza Stream, to which the valley owes its name.
They emerge at the base of Monte Cassio flysch, and rise sharply with a steepness of 50°-70°, until reaching up to 10 meters high.

This particular formation extends from Monferrato to Appennino Modenese, but just in this area the tectonic movements made this sedimentary stone of sub-marine formation to emerge in the forms of high peaks shaped by atmospheric agents.

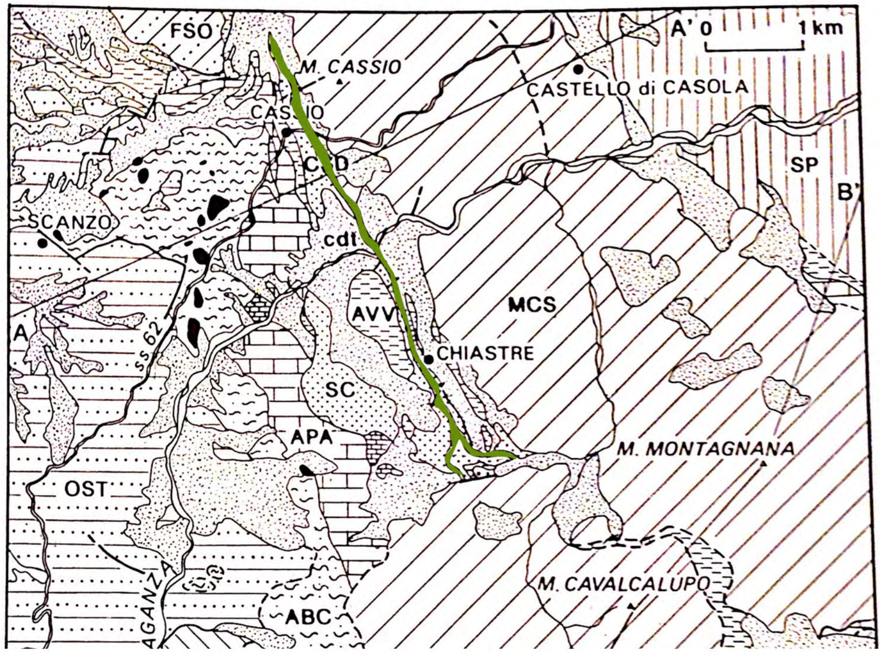
MCS Flysch Monte Cassio

AVV Varicolored clays

SC Clay and sandstone turbitide

APA Clay alternations

CSD Conglomerates of Salti del Diavolo

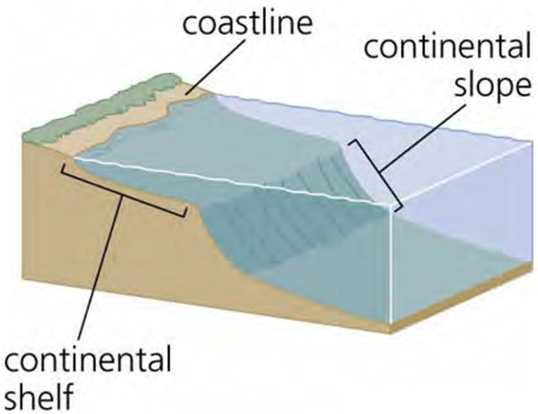


CAST SEDIMENTARY ROCK FORMATION

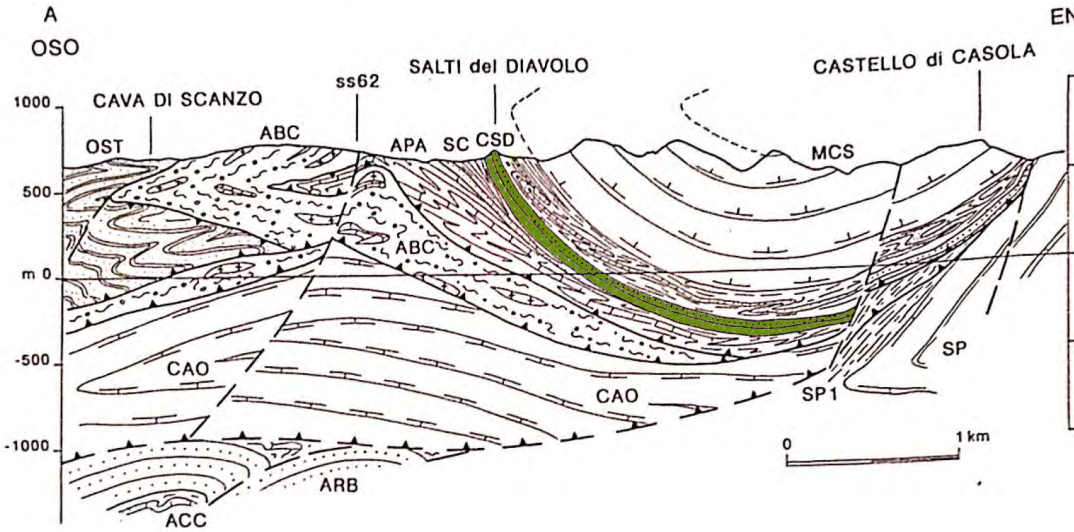
Weathering
The Salti del Diavolo are heterogeneous conglomerates and sandstones formed by detritus coming from the erosion of the austro-alpine and south-alpine continental margin.

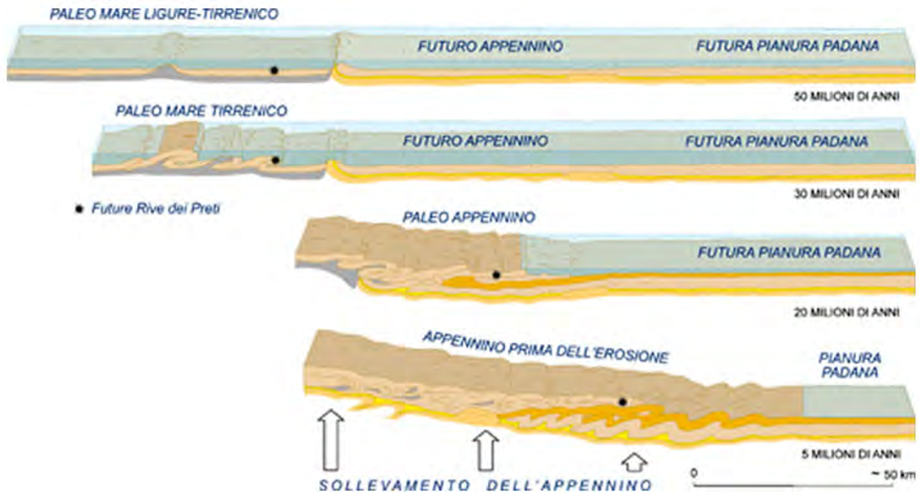
Transportation
The conglomerate pebbles have then been subjected to ancient fluvial transport.

Deposition
The sediments accumulated on the littoral of the ancient Tetide Ocean. Here gravitational flows and disastrous landslides caused their spreading down to the "continental slope" for kilometres on the ocean floor, where the fragments re-deposit.



Lithification
After the emergence, this rock stratification was primarily moved to the actual position, inside the so called "Falda Ligure". Then it was vertically disposed by the tectonics pressures caused by the formation of Apennines.
The compactness and the fine grain of the sand stones at the summit of the ridge and the steepness of the extrusions shape make them particularly resistant to weather conditions respect to the surrounding varicolored clays, contributing to the imposing of the Salti del Diavolo over the surrounding hills.

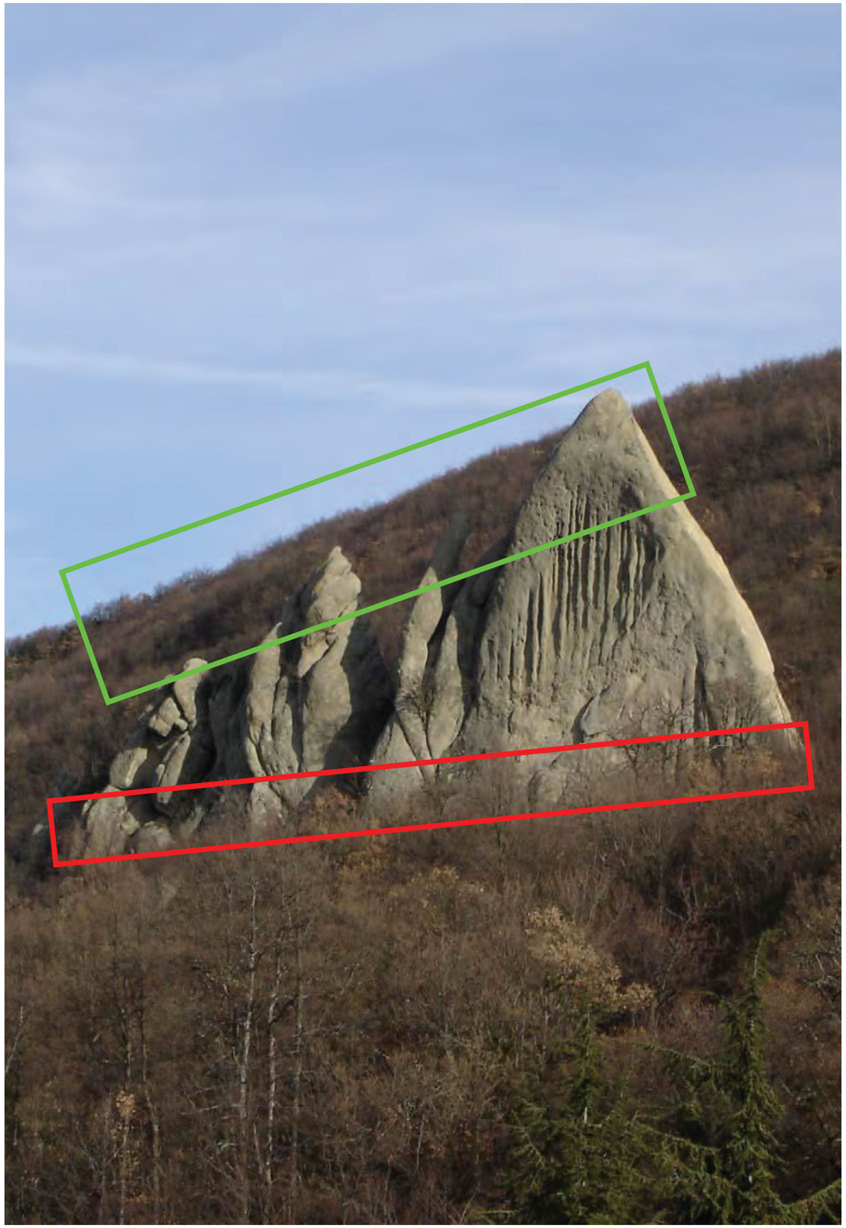




SALTI DEL DIAVOLO
stone type and composition

A

B



The Salti del Diavolo complex can be defined as a **CLASTIC SEDIMENTARY ROCK**.

Clastic sedimentary rocks are composed of other rock fragments that were cemented by silicate minerals. Clastic rocks are composed largely of quartz, feldspar, rock (lithic) fragments, clay minerals, and mica; any type of mineral may be present, but they in general represent the minerals that exist locally.

In this particular case, the sedimentation derives from an underwater landslide of pebbles and stones that can be date back to 80 milion years ago.

More in detail, this rock has the following mineralogical composition:

the MATRIX → fine grain, with CLAY and FELDSPARS
the PEBBLES → stones of different types and origins: granites, porphyrys, flint and pelitic fragments.

→ it is a SILICATIC rock, because of the feldspars' chemical composition (Na, Al, Si, O)

A crucial character of this kind of rock is the difference, in terms of grain size, between the upper and the lower part.

A SANDSTONE: medium grain size, around 1/4 - 1 mm, not very homogeneous: the clasts bigger than 1 mm are quite frequents. This part of the Salti del Diavolo is called MAS LADEIN.

B CONGLOMERATE: bigger grain size, around 2 mm.

P.S. Despite the difference in the grain size, the mineralogial-chemical composition is the same. What changes is the porosity, higher in the conglomerates, that influences the permeability.

TAB. 1

Composizione mineralogica-modale delle arenarie di Scanzo e dei Salti del Diavolo.

	Arenarie di Scanzo			Arenarie dei Salti del Diavolo		
Campione	SC-A1	SC-A2	SC-B	SD-A	SD-B1	SD-B2
Quarzo	33.8	13.3	18.4	29.2	24.2	27.7
K-feldspati	0.4	0.5		16.9	10.7	10.9
Plagioclasi	2.9	1.7	3.5	16.9	10.5	10.5
Vulc. acide	1.8	3.1	5.6	3.1	2.3	2.3
Vulc. basiche	0.2	0.9	1.3	0.2		1.2
Filladi minute	2.2	6.1	8.1	0.7	1.9	2.0
Scisti alb. ep.			0.3			
Serpentiniti			0.3	0.4		0.2
Argilliti				0.7	0.2	1.9
Siltiti		0.7	1.3	0.4		0.2
Selci	0.9	1.4	1.9	3.7	10.0	5.0
Calcari extra. (CE)	20.2	23.5	17.8	5.9	22.1	11.5
Calcari intra. (CI)	20.2*	23.5*	17.8*			
Miche e cloriti	2.4	1.7	4.8	6.6	2.1	7.0
Altri	0.7	1.4	1.3	0.2		1.0
Spatite (cemento)	14.3	22.2	17.7	15.1	16.0	18.6
	100.0	100.0	100.0	100.0	100.0	100.0
Granuli siltosi	2.0	3.4	6.5	3.4	1.4	3.5
Q	54.1	26.0	31.5	37.4	29.5	37.7
F	5.3	4.3	6.0	43.3	25.9	29.2
R	8.2	23.8	32.1	11.8	17.6	17.4
C	32.4	45.9	30.4	7.5	27.0	15.7
Q	80.1	48.0	45.2	40.4	40.5	44.7
F	7.8	7.9	8.6	46.9	35.5	34.6
R	12.1	44.1	46.2	12.7	24.0	20.7
K/(K+P).100**	12.0	22.7	0	50.0	50.5	51.4
Diam. max mm	0.3	0.12	0.3	1.0	2.0	2.0
Diam. med mm	0.2	0.06	0.2	0.3	0.7	0.7

* Valore stimato

** K-feldspati/(K-feldspati+plagioclasi).100

TAB. 2

Composizione chimica delle arenarie di Scanzo e dei Salti del Diavolo.

	Arenarie di Scanzo		Arenarie dei Salti del Diavolo	
Campione	SC-A	SC-B	SD-A	SD-B
SiO_2	32.00	32.41	60.64	55.77
TiO_2	0.24	0.31	0.25	0.16
Al_2O_3	4.98	4.66	9.73	7.74
Fe_2O_3	2.18	2.37	2.85	1.47
MnO	0.17	0.16	0.16	0.16
MgO	3.55	4.49	1.67	2.68
CaO	30.11	29.07	10.88	15.29
Na_2O	0.37	0.36	2.35	1.27
K_2O	0.70	0.62	2.46	1.95
P_2O_5	0.07	0.06	0.06	0.06
P.F.	25.63	25.49	8.95	13.45
	100.00	100.00	100.00	100.00

The silico-clasitc component is given by the presence of quartz, feldspars and subordinate lytics.

Among the lytics, the most diffuse are the sedimentary ones.

PHYSICAL - MECHANICAL FEATURES
of the Mas Ladein (sandstone)

TAB. 3

Caratteristiche fisiche e meccaniche delle arenarie di Scanzo e dei Salti del Diavolo.

Campione	Arenarie di Scanzo SC-A	SC-B		Arenarie dei Salti del Diavolo SD-A	SD-B
Massa volumica apparente (Kg/m³)	2633	2652		2552	2545
Massa volumica reale (Kg/m³)	2843	2840		2766	2812
Grado di compattezza (adimensionale)	0.93	0.93		0.92	0.91
Coefficiente di imbibizione (%)	0.76	0.44		1.3	1.52
Porosità totale (%)	7.6	7.4		7.7	9.5
Porosità accessibile all'acqua (%)	2.00	1.17		3.32	3.87
Carico di rottura a compressione semplice perpendicolare al verso (MPa)	156	156	DRY	129	150
Carico di rottura a compressione semplice parallela al verso (MPa)	156	155		128	139
Carico di rottura a compressione semplice perp. al verso, dopo gelività (MPa)	158	161	AFTER FREEZE-THAW CYCLES	130	127
Carico di rottura a compressione semplice paral. al verso, dopo gelività (MPa)	139	161		138	137
Carico di rottura a compressione semplice perp. al verso, dopo saturazione (MPa)	145	127	SATURATED WITH WATER	104	101
Carico di rottura a compressione semplice paral. al verso, dopo saturazione (MPa)	143	127		103	99
Carico di rottura a trazione indiretta mediante flessione (MPa)	34	36		16	10
Resistenza all'usura per attrito radente relativa al granito di S. Fedelino	0.75	0.73		0.58	0.66

Physical-mechanical data do not exist about this type of rock. In order to know the charachteristics of these rocks have been carried out a series of test on two layers A and B.
(All the measurements have been done according to the UNI regulations: Ente Italiano di Unificazione)

- Looking at the apparent density, they can be defined as HEAVY rocks.
- Looking at the ratio between apparent and real density, close to 1, they are COMPACT.
- The freeze-thaw cycles do not determine big changes in the breaking load values, and for this reason this sandstone is defined resistant to frost - weathering".
- The decrease of the ultimate compressive strenght is very high when the rocks are saturated with water: if we compare these values to the ones at dry state (from 19% to 33%).
The internal pressure generated by the water makes the ultimate compressive strenght decrease.

MAIN DEFINITIONS

APPARENT DENSITY (kg/m^3): ratio between the sample's mass at dry state and its apparent volume (volume defined by the external surface).

very light rocks	$\rho_a < 1000$	kg/m^3
light rocks	$1000 < \rho_a < 1500$	kg/m^3
medium heavy rocks	$1500 < \rho_a < 2500$	kg/m^3
heavy rocks	$2500 < \rho_a < 3000$	kg/m^3
very heavy rocks	$\rho_a > 3000$	kg/m^3

REAL DENSITY (kg/m^3): ratio between the sample's mass at dry state and its real volume (volume that takes into consideration the internal voids and porosities).

FIRMNESS DEGREE: ratio between the apparent and the real density.

TOTAL POROSITY (%): ratio between the pores' volume and the apparent volume of the test piece.

extremly porous	$P > 20\%$
very porous	$10\% < P < 20\%$
quite porous	$5\% < P < 10\%$
medium porous	$2.5\% < P < 5\%$
little porous	$1\% < P < 2.5\%$
very compact	$P < 1\%$

POROSITY ACCESSIBLE TO WATER at atmospheric pressure (%): ratio between the pores accessible's volume and the apparent volume of the sample.

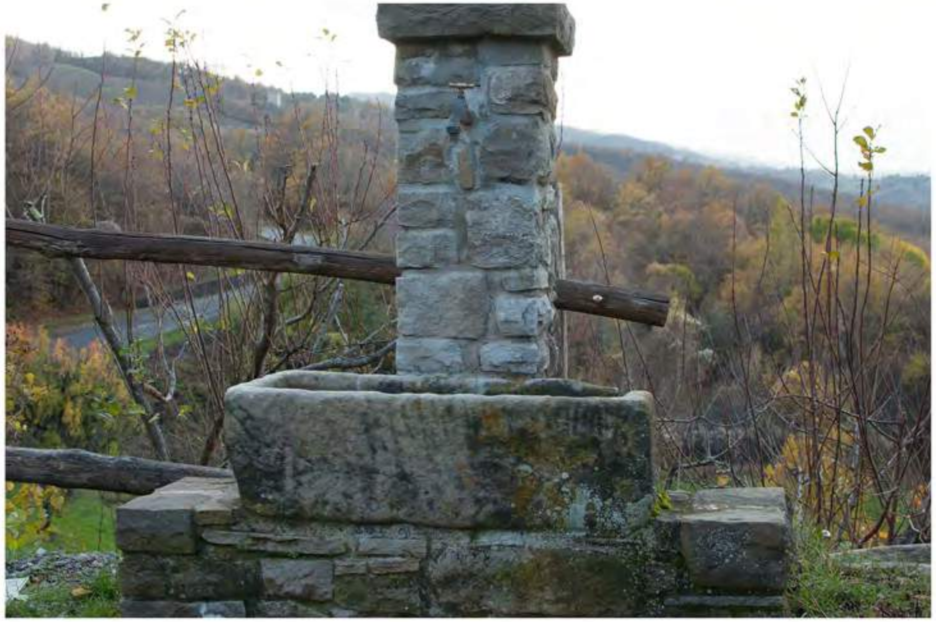
ULTIMATE COMPRESSIVE STRENGHT (MPa): unitary load needed to break a cubic sample with 71 mm corner. The tests have been carried out with the load acting both perpendicular and parallel to the sample.

ULTIMATE COMPRESSIVE STRENGHT on samples saturated with water, at atmospheic pressure (MPa)

ULTIMATE COMPRESSIVE STRENGHT after frost weathering (MPa): the samples saturated with water have been subjected to 20 freeze-thaw cycles, then dried at 110°C, then subjected to compression until break.

SANDSTONE

CONGLOMERATE



CULTURAL RELEVANCE

A grindstone, just outside the abandoned quarry in Chiastre di Ravarano

The lunette on the facade of the Pieve of Talignano

On a cultural point of view, this particular kind of conformation has deeply influenced the settlements in the nearby villages.
This rock was, indeed, the physical and economical basis on which the life of the peasants was centred.

The capability of these people to use their natural resources at their best, yet respecting the environment, gave life to generations of qualified stonemasons, whose work was even demanded abroad.
This rock has been culturally important also in medieval times.

It can be reconnected to the roman Pievi (popular churches connected to baptistery) spread throughout the Parmesan Apennines, along the Via Francigena.
This important street connected Rome to the northern Europe, and it was covered by thousands of peregrines every day. The stone of "Salti del Diavolo" can be found, indeed, in many churches along this street, Pieve of San Prospero in Collecchio and Pieve of San Biagio in Talignano among the others, both built in the XIII century.

But one of the most relevant and known example is that of the Duomo of Berceto, built on a Benedictine Abbey of VIII century.
The Duomo has been subjected to several restoration interventions, and in 1845 they remade the entire façade in sandstone from the Riva Santa quarry.
The only thing that was kept like it was in the past is the lunette of the XII century, in “Salti del Diavolo” sandstone.

STONEMASON'S TOOLS

There are two types of tools: the percussion tools, used to chop, hit or cut the rock, and the abrasive tools, used to abrade the stone, grid it and remove the material. The percussion tools can be divided in direct (they hit the stone) and indirect (are hit by other tools). Nowadays, the few stonemasons remained in Italy all use the pneumatic hammer, with the same techniques.
Starting from the extraction, here are the main tools a stonemason would use for his work.

EXTRACTING THE ROCK

1

2

5

4

3

IRON PLUG AND IRON FEATHERS (TAGLIOLE):

These three tools were used together in order to cut the stone out of the mountain, after having drilled a few holes and having filled them with gunpowder.
The iron plug was inserted in the holes and were driven between the two iron feathers. Subject to a crescent pressure, the holes would eventually widen up and the block could be taken from the quarry.
The stonemasons had to be careful not to make the plug go lower than the feathers, otherwise it would be just compression.

EXTRACTING THE ROCK

300 g

700 g

900 g

PUNCIOTTO

A different kind of iron plug, used in the same way as the other, for a different size of the hole made with the drill.

ROUNDED HAMMER (MAZZETTA BOMBATA)

Hammer used for different works, according to the depth the plug has to reach and to the required strength.
In order to obtain the required job, there are different hammers with different weighs.

WORKING THE STONE

METAL STRAIGHT EDGE (SCAPEZZATORE)

Used together with the rounded hammer to obtain squared blocks, with straigth, precise lines.
In order for the tools to work, the block needs to be cleansed from the lime,
which would otherwise deaden the stroke.

REFINING THE STONE

FLAT CHISEL (SCAPELLO)

Only used in a secondary phase of the work, after the stone has been cut and squared.
It is mostly used for the “riastrino”, which frames the surface of the stones.

GRADINA

Used for flattening the surfaces after they have been roughly prepared with the flat chisel.
One of the most frequently used tools in the “faking” of surfaces, along with the bocciarda.

REFINING THE STONE

POINT CHISEL (PUNTA)

Made of round or octagonal steel with one end pointed. Used for chipping off the round faces of the stone and reducing them to approximately plane surfaces, ready for the peen hammer.

PLATES BUSH HAMMER (BOCCIARDA A PLACCHETTI)

Hammer with small pyramids, usually diamonds, projecting from its working face, also used for dressing the stone.
The repeated impact of this hammer into stone creates a rough pockmarked texture that resembles naturally weathered rock

BUILDING TECHNIQUES

• From rock to stone

The work in the cave was organized like this:

1. recognition of the most suitable block for a certain function in the cave
2. workers, with picks and shovels, removed the dirt and soil dust from the top of the chosen block
3. the block was then cut with iron wedges in rough blocks
4. first refinement with hammers and chisels

The main caves of this area (Chiastrone, San Benedetto, Cisura, Galinoia, Canavera, Ronchi) were used until the 1970s. During the XXth c. , the extractive technique was carried out by the use of gunpowder:

3a. a hole was created with a barra-mina with chisel edges, and its lenght depended on the dimentions of the block that had to be extracted.

3b. gunpowder was inserted in the holes and the block detached easily from the cave's wall

• Mortar

A particular characteristic of the houses of this area is that they are almost entirely made of the materials that the inhabitants took from the local caves.

An interesting example is the mortar: the Salti del Diavolo sandstone is used as the aggregate.

3 to 4 parts of sandston are mixed with 1 of cement. After the sandstone and cement are thrown on a platform, they must be mixed by shoveling the two materials together, at least twice, so that the cement may be incorporated with the sandstone. A little lime may be added in winter to prevent freezing. Sufficient water is added to make a stiff paste, and the mortar must be immediately conveyed to the work and used, as the cement sets, or hardens, very rapidly, and after it is once hard the mortar cannot be used again.

• Rubble stone foundations and walls

All the buildings we can find in Chiastre are built with the sandstone from the nearby quarries, mainly from the Galinoia one.
Here the squared blocks of stone were extracted according to the methods previously explained, and then carried up the mountain to the village, where they were roughly squared and prepared for the building up of the houses.

Being these houses mainly from the XVIII century, they were built with very simple techniques, starting from foundation walls in stone rubble.

All the walls were to be bonded together with the bond stone, or header, and, for the 60 cm thick walls, there would be a header every second row.
These headers also keep the foundation from splitting apart crosswise when weight is placed upon it.
The main walls would be then based upon these foundations.

The stones that compose the outside walls are pressed together until the more prominent angles on their faces come almost in contact, and the gaps in between are filled with chips or rubbles and the mortar.

In order to obtain this, therefore, they needed to use the sandstone extracted in quarries near the river, giving its minor porosity.

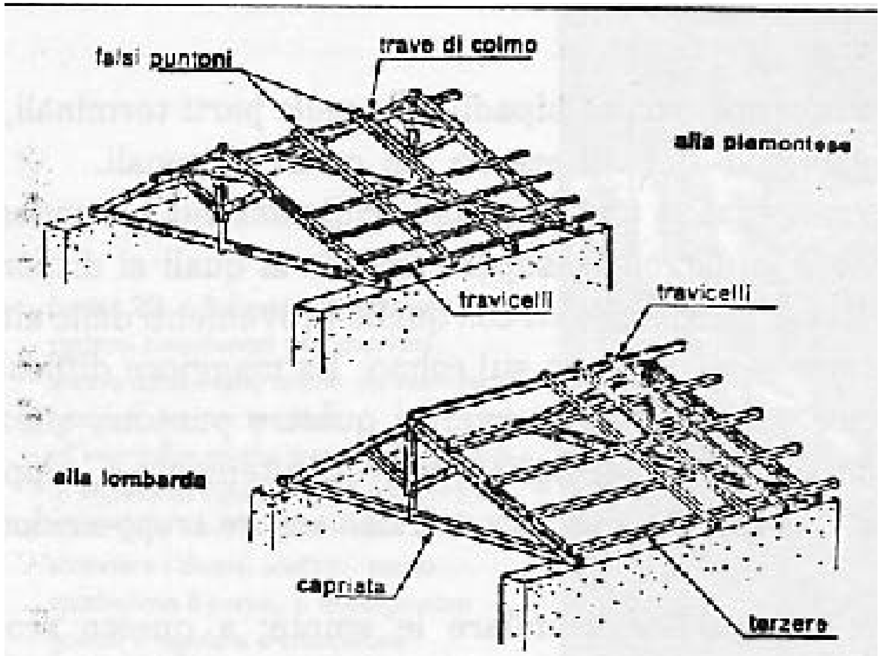
The same stone was also used to make chimneys, steps, and the outside frame of the windows, using a simple post and lintel technique.

• Roof

The local stones are frequently used even in roof construction, for they are easy to be found and they can efficiently resist to the deterioration caused by the atmospheric agents.
Moreover, the stones' use in the roofs guarantee:

-waterproofing
-low thermal conductivity
-relatively high mechanical resistance to the eventual loads of precipitations.

The fine grain sandstone is particularly suitable for this purpose, since it is possible to understand its stratification during time and to follow, in the cutting, the planes on which the rocks naturally and regularly split.



There exist various types of stone covered roofs, from double pitched roofs to intersected and more complicated ones.
In the simplest case, the stones slabs are disposed on overlapping layers on a wooden structure, itself supported by wooden beams.

-Primary structure: series of PURLINS parallel to the eave, at a distance of 1-1.5 meters.

-Secondary structure: Then secondary structure of common RAFTERS is constructed orthogonally to the main one, kept together by wooden or iron nails. Battens parallel to the eaves are further added.

On the complete structure, wooden boards are disposed parallel to the eaves, recently protected with tar paper to increase its water resistance.
Finally the stone covering can be placed, starting from the eaves, where the laying of the first layer will determine the inclination of the sheathing, usually around 20-30%, till reaching the ridge beam.

The roof this made presents an higher inclination respect to the tiles covered roofs: the stone slabs in fact, in order to ensure a complete waterproofing and not to slide down, need to be overlapped for 2/3 of their length, thus increasing the angle with the ridge beam.

The disposition of the stone slabs goes on according to their dimension, from the big ones on the eaves, until the medium and small ones for the rest of the covering.

Since the slabs are not uniformly high, some adjustments can be made with the addition of small pieces of sandstone between the elements. While going to the ridge beam, the steepness of the stone disposition decreases slowly, so that when the two sides meet, they match almost horizontally.

Nowadays the stone covering for the roof is a practice almost only used in restoration interventions. Principally because this roofing technique is particularly expensive, for it requires a greater amount of material respect to the space needed to cover. Secondarily, the lack of specialized artisan for the stone slab placement and the closing of the local quarries determined another important factor for this method dismiss.

The maintenance in these constructions has to be carried out every year to ensure roof resistance to the weather conditions. However, if the stone disposition is regularly checked to keep high the waterproofing performance, the long life of a stone covered roof makes this construction advantageous in long terms calculations.

MAS LADEIN IN BUILDING DECORATION

The Salti del Diavolo sandstone is suitable to be carved due to its properties. It is possible to find a lot of decorations, especially on the portals, in many churches along the via Francigena.

All these stoneworks derive from a strong local tradition, related to the figure of the STONEMASON: after the stone is quarried, it is worked and carved entirely by hand.

The main working tools are hammers, chisel, bush-hammers and wedges.

S. Prospero church, Collecchio, 1100. Facade and entrance staircase restored in 1935, using the Salti del Diavolo sandstone.

S. Maria Assunta, Fornovo, 845. Restoration in 1745,1927-1942, using in the facade decorations the sandstone of Salti del Diavolo.

S. Biagio, Talignano, 1230. Restored in 1930 and 1942. The romantic lunette, representing the Psicostasis (the soul's weighing), is made of Salti del Diavolo sandstone.

The most relevant building where the Salti del Diavolo sandstone is used is the DUOMO DI BERCETO (XII cent, restored in '400 and '800).

Here the sandstone is used both outside, in the lunette of the main facade's portal, and inside, for the columns. They are obtained from worked and superimposed stoneblocks, from which derive also the capitals.

DETERIORATION MECHANISMS

The deterioration mechanism of stones can be generated by:

- natural processes (chemical, physical, biological)
- problems related to pollution.

• CHEMICAL ALTERATION PROCESS:

For what regards the chemical alteration of the stone due to some solutions, in some areas around the rifts can happen some oxidation reactions of the metallic sulfurs and of the iron oxides that lead to the formation of metallic hydroxides, which is the main cause of the alteration in COLOR of the rock.

When the iron sulfurs are exposed to oxygen, they oxidize and let the start of the formation of iron hydroxides, iron sulfates and H+ ions.

With a deep microscopic analysis, realized on two different sandstone (taken in the same quarry) but one uncontaminated and one having a deterioration action already started:

uncontaminated rock
it shows clastic component with
carbonate cement within the cracks

it is characterized by cracks and calcite cement

deteriorated rock
the cement is dissolved,
leaving the cracks as empty spaces

it is characterized by nearly total dissolution of the interstitial calcite and by wrecks of pyrite, transformed in iron hydroxides

the presence of these iron hydroxides causes the chromatic alteration

The results show that the chromatic change results only from alteration chemical processes and not from any different type of lithologic process.
Moreover, after some studies, it was clear that the atmospheric attack of dusts and gasses (CO_2, SO_2 and NO_2) does not have a tough and powerful impact on the stone.

• PHYSICAL ALTERATION PROCESSES:

The main PHYSICAL CAUSE that affects the rock is the TERMAL EXPANSION.
This action causes expansions and contractions.

The expansion coefficient is fundamental for the choice of the most suitable products to use in the reinforcement and waterproofing of the rock, because they need to have expansion values similar to the ones of the material intended to use.

Ignoring that factor would cause serious damages such as bending, fractures or exfoliation of the surfaces.

After some studies and researches, the average value of the coefficient of thermal expansion for the sandstones is $11{,}5 \times 10^{-6}/°C$.
This value in sandstones is higher than the one observed in other classes of rocks, such as marbles and granites.

Among the processes of physical alteration, the most important ones are the one caused by FROST WEATHERING and CLASTIC TERMAL EXPANSION.

They are linked with porous materials so when the water inside of them changes state

variation in volume -> increasement of 9%.

The damage produces a lattice of micro fractures that support the crumbling of the material and the detachment of small portions of the rock.
The sandstone is a quite porous rock, with porosity values from 7% to 8%.
This value tend to increase if the material is exposed to FREEZING and THAWING CYCLES.

• BIO DETERIORATION PROCESSES:

Sandstones are also affected by some bio deterioration agents, which act with different consequences according to the characteristics of the environment.
The bio deterioration action has a relevant importance and is represented mostly by the attack of lichens, which are organisms able to survive with certain amounts of water concentrations.

They are organisms that form circular aggregates of different colors (green-yellowish, red, grey).

The majority of them are CRUSTOSE LICHENS, which means that they are strictly tight to the substrate for various millimeters.
Lichens push on the rock's surface through concentrations and expansions according to the humidity present in the environment.
This mechanism causes various deterioration processes such as DECOHESION, RIFTS and BIO CORROSION.

The presence of these lichens depends on the environment's ccharacteristics: they are not present in few amounts in highly polluted environments.

In addition to lichens, on the most humid and shadowed parts of the rocks, there could be the presence of algae (dark green in color) and of mosses, which contribute to accentuate the processes of deterioration already in act.

The sandstone of the Salti del Diavolo, with very few concentration of carbonatic cement, in the most exposed areas (the ones in which it can absorb more water) tends to desegregate uniformly.
On the contrary, in the most protected and sheltered parts, it tends to preserve.
In conclusion, it is important to say that the Salti del Diavolo sandstones tend to desegregate isotropically.

MANTAINANCE AND PRESERVATION

For what regards some aspects used to improve performance and durability, there are some protections which aim to SLOW DOWN the deterioration processes.
The application of some chemical protections on the surface is necessary every time that there is the presence of any kind of external agents that may cause damage to the material (such as humidity, pollution…)

These chemical protections need to:

-have chemical inertia regarding to the rock;
-have absence of damaging agents;
-be waterproof;
-have minimum influence on the chromatic aspect of the material.

The most used protective products are acrylic resins.

AND TODAY

Nowadays the village is almost uninhabited, if not during summer when the vacationers come to the old family houses to enjoy the fresh air of the Valley. The disappearing of the demand for specialized stoneworkers and the development of new construction methods caused a slow abandonment of the village and, in a larger view, of the entire valley. This sad phenomena should stay as a proof of how the local population was basing its life on these natural resources and how the material's fortune was determining the possibility of people to live in such unique places.

The Valley is now trying to reinvent its economy promoting a sustainable and cultural tourism, opened to all the people concerned by knowing these particular places. The Salti del Diavolo are the destination of hiking and open-air sports' lovers, who can walk through the ancients paths of the stonemasons, discovering the quarries and sculpted works on their way. An important requalification of the place is also made by the local artisans, like the artist Paolo Sacchi, who decided to study the old masters' practices and to share its knowledge to interested people through workshops and meetings; for it is important to keep the memory of these places alive in order to make them continue to live.

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