Carrara Marble: a nomination for ‘Global Heritage Stone Resource’ from Italy

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Abstract: Carrara Marble, from Italy, probably one of the most famous dimension stones in the collective memory and in ordinary people, is here nominated as a suitable ‘Global Heritage Stone Resource’.

Quarried since pre-Roman times, the Carrara marble is the testimonial of an area/industry that was able – for a variety of reasons not easily repeatable in future stone history – from the dawn of the stone sector, to trigger a flywheel effect on a global scale. Suitable for any environment and cultural context, this versatile marble has been appreciated in almost any field of application – from building to architecture, from fine arts to urban landscape, from funerary art to modern 3D design – probably reaching its highest point in the eternal works of famous sculpturers, artists and architects such as Michelangelo, Donatello, Jacopo Della Quercia, Canova, Bernini, and many others. It is currently excavated in more than 100 quarries, processed almost everywhere and sold all over the world.

Carrara Marble takes its name from the Italian city of Carrara where it has been quarried for more than 2000 years and is still being quarried to this day at a rate of about 1 500 000 tons per year. It was during Roman times that the marble started to be extracted in great quantities as it became the material of choice for public buildings across the Roman Empire.

We are not far from the truth if we state that in the collective memory, in ordinary people or in any technical office not devoted expressly to stone, marble is automatically associated with the word Carrara. Indisputably, for decades and decades, there has been this word association: marble means Carrara and Carrara means marble. In few other commodity sectors is a word so automatically associated with a name, engendering an identification process that, despite the inexorable onslaught of globalization, continues to exist.

The Carrara district is an area/industry that was able – for a variety of reasons not easily repeatable in future stone history – from the dawn of the stone sector to trigger a flywheel effect on a global scale. The district is part of a wider territory – the Apuan Alps region, northwestern Tuscany, Italy – where five important extraction areas for marble production can be recognized; Lunigiana area, Garfagnana area, Versilia area, Massa area and the Carrara area sensu stricto. This region is approximately 30 km long and 12 km wide with marble outcrops useful for commercial purposes covering over 75 km².

The term Carrara Marble, geographically referring to the marbles extracted in the surroundings of the town of Carrara, is in reality a general one, erroneously used for a long time to define a multitude of different marbles (more than one hundred commercial varieties) extracted in the whole Apuan Alps region. Such misleading usage, substantially justified by the long history of all the marbles produced in the Apuan Alps region and by their commercial impact, can generate misunderstandings, since it is often believed to define a single commercial variety.

It would therefore be more correct to deal with Apuan Alps marbles, the most famous of which is the Carrara Marble sensu stricto.

Formal name for this proposed ‘global heritage stone resource’

‘Carrara Marble’.

Origin of name

The name ‘Carrara Marble’ takes its origin from Carrara, a small town located at the foot of the Apuan Alps, Massa province, Northwest Tuscany region, Italy.

Geological name

Marbles and dolomitic marbles (the ‘Carrara Marbles’).

Other names

In local usage the term ‘Apuan Alps marbles’ indicates all the marble formations cropping out in the
whole Apuan Alps area while ‘Carrara marble’ stands for the Liassic marbles mainly located in the northwestern Apuan Alps area in the surroundings of the town of Carrara.

**Commercial designations**

Contrary to what might be thought to be the so-called Carrara Marble, which is often identified merely as white marble or as the very famous Statu-ary by the non-experts in the field, Carrara Marble comprises a wide variety of types of marble with different chromatic and structural characteristics. Quantitatively and industrially most important, the Marble sensu stricto formation offers some commercial types that are clearly defined for the entire extension of this formation all over the Apuan Alps. Such commercial types are seven, and are the following:

1. ‘Marmo Bianco Carrara’ (White Carrara marble);
2. ‘Marmo Venato’ (Veined marble);
3. ‘Marmo Bardiglio’ (Bardiglio marble);
4. ‘Marmo Nuvolato’ (Cloud-like marble);
5. ‘Marmo Arabescato’ (Arabesque-like marble);
6. ‘Marmo Statuario’/‘Statuario Venato’ (Statu-ary marble/Veined statuary);
7. ‘Marmo Calacata’ (Calacata marble).

These can be subdivided into many other types due to slight chromatic variations, which are often characteristics of a very restricted area or just one quarry, or even one limited period of time. The most relevant characteristics of the seven main varieties are summarized below.

(1) ‘Marmo Bianco Carrara (White Carrara marble)’: ‘White Carrara’ (Fig. 1a) is one of the classical Carrara marbles. It is a fine- to mid-coarse-grained marble, more or less homogeneously pearl-white coloured or with tiny grey spots and thin, short veins irregularly distributed. Its dominant characteristic is that it contains only a very limited number of impurities in the form of micro-cryptocrystalline pyrite. The three main varieties of White Carrara are classed according to the colour of the groundmass and are known as C, C/D and D. The C variety has a very light groundmass with an even vein pattern that is not very marked. C/D varieties have a regular groundmass but not as white as the C variety, whereas the D variety also has a regular pattern but a darker, white-greyish groundmass.

In many places, these varieties are almost identical (with respect to colour and decoration) to the ‘Marmo Venato’ (see 2 below), hence it is often difficult to draw a valid boundary in-between. One particular variety is Bianco P, quarried in the Massa basin (see Principal Location of Quarries). This is a very sought-after material due to its

![Fig. 1. The main commercial varieties of the Apuan Alps marble.](http://sp.lyellcollection.org/Downloaded from at Books Editorial Committee on May 19, 2017)
compactness and homogeneous, veinless and almost completely white colour.

Traditionally White Carrara is cut against the grain (the hard way) or, less frequently, with the grain (the easy way). It is quarried in all the Carrara basins except Pescina- Boccanglia (see Principal Location of Quarries). In the other Apuan quarry sites, white marble with similar characteristics to White Carrara tends to be called by local names, often corresponding to the place where it is quarried.

(2) ‘Marmo Venato’ (Veined marble): This is a mid-grained, pearl-white to light grey marble (Fig. 1b) with a fairly regular network of more or less dark grey veins (centimetre to millimetre in width). On the whole, this variety comprises many sub types whose aspect and structure range from an unworked met breccia to almost regular compositional alternations. Like White Carrara, this variety can be classed either as C, C/D or D. Some types come from the Carrara area sensu stricto (see Principal Location of Quarries) mainly from Gioia basin, while other varieties are quarried in the areas of Massa, Fivizzano and Minucciano (see Principal Location of Quarries). It is one of the most common varieties throughout the Apuan Alps.

Traditionally Venato materials are cut against the grain (the hard way) or perpendicular to the grain (the easy way) depending on the desired decorative effect.

(3) ‘Marmo Bardiglio’ (Bardiglio marble): This fine-grained marble (Fig. 1c) is characterized by a grey colour due to abundant microcrystalline pyrite. Several, usually dark grey to blackish veins are frequent, locally forming a sub variety known as veined ‘Bardiglio’; dolomitic levels may be present as well. The name of this family comes from a derivation of the Spanish word ‘pardo’, which is the colour dark grey, which also refers to a cloudy sky.

The Bardiglio family is one of the most typical of the Apuan Alps and is characterized by a very compact structure with the peculiarally even dark grey colour of the groundmass. The Imperial variety, typical of Garfagnana (see Principal Location of Quarries), has an even grey-blue groundmass with no marked veins. Traditionally Bardiglio is mainly cut against the grain (the hard way) or parallel to the grain (the easy way). Bardiglio varieties are found to a varying extent in all the quarry sites throughout the Apuan Alps.

(4) ‘Marmo Nuvolato’ (Cloud-like marble): Marmo Nuvolato (Fig. 1d) is a fine- to medium-grained grey marble crossed by numerous, more or less marked, light grey to whitish veins and irregular strips. This variety often includes more homogeneous grey bodies or metabreccia lenses, respectively resembling the ‘Bardiglio’ and ‘Arabesca’ types (see 5 below).

(5) ‘Marmo Arabesca’ (Arabesque-like marble): These are meta-brecias (Fig. 1e) with predominant clasts and boulders of white-to-grey marbles in a minor, more or less dark grey carbonate matrix; the fragments mainly derive from White Carrara, Veined and ‘Nuvolato/Bardiglio’ types. An appreciated sub-variety is the ‘Marmo Brouillé’, quarried mainly in the Colonnata basin (see Principal Location of Quarries), is characterized by well-marked grey matrix in veins thicker and more persistent than in the normal ‘Arabescati.’ The name of this family comes from the geometric patterns typical of Islamic art. Traditionally this variety is mainly cut against the grain (the hard way), or parallel to the grain (the easy way), so as to highlight the material’s decorative qualities.

It is quarried mostly in the Versilia area but is also found in the Garfagnana and Massa areas and to a lesser extent in the Carrara area (see Principal Location of Quarries).

(6) ‘Marmo Statuario’ / ‘Statuario Venato’ (Statuary marble/Veined Statuary): This is very pure coarse-grained marble (Fig. 1f), ivory-white to very light yellow-cream coloured that normally has no veins or very shaded ones. It has been used for sculpting since Roman times because of its ivory ‘warm’ colour and its particular crystalline texture that naturally lends itself to chiselling work. Where some accessory minerals form widespread, anastomosed thin veins, the vein pattern is more frequent and evident, and the material is called Statuario Venato.

Statuario marble, together with Calacata Marble (see 7 below) is among the most renowned and precious of the entire Apuan region. Production is concentrated in the Carrara basins of Torano and Miseglia (see Principal Location of Quarries). Traditionally the material is cut against the grain (the hard way).

(7) ‘Marmo Calacata’ (Calacata marble): The name (Fig. 1g) derives from the locality Calacata north of Torano village in the Pescina- Boccanglia basin (see Principal Location of Quarries) where this variety is mostly exploited. It is a meta-breccia with very light white-yellowish marble clasts and, rarely, light greenish and yellow-ochreous veins.
A highly precious sub-variety is the so-called ‘Calacatta Macchia Oro’ (Goldspotted Calacatta).

Traditionally the material is cut against the grain (the hard way).

In addition to these seven main commercial types, at least two more varieties should be mentioned: Marmo ‘Paonazzo’ (Purple-Violet Marble) and Marmo ‘Zebrino’ (Striped Marble). The Marmo ‘Paonazzo’ (Purple-Violet Marble) is a meta-breccia with clasts chiefly derived from Statuary and/or Calacata types, with a characteristic purple-violet pigmentation of the clasts. The Marmo ‘Zebrino’ (Striped Marble) is a variety consisting of decimetre-thick layers of white-yellowish marbles regularly alternated with thinner beds of grey-greenish marble. At places, the truly marble rock shifts into a sort of calc-schist, globally similar to the Statuary and named ‘Cremo Delicato’ (light cream-coloured marble) or ‘Cremo Tirreno’ when the veins are green-greenish. Cremo Delicato is quarried in the Carrara basins of Torano and Miseglia whilst the Cremo Tirreno variety is quarried in Versilia (southern Apuan Alps) (see Principal Location of Quarries). Traditionally both materials are cut against the grain (the hard way).

Marmo ‘Paonazzo’ (Purple-Violet Marble) and Marmo ‘Zebrino’ (Striped Marble) are statistically not relevant, are produced in very limited amounts but have a large worldwide diffusion and are quite renowned from a decorative point of view.

The incidence of the most important commercial varieties in the global production of the Apuan Alps region is as follows:

- ‘Marmo Bianco Carrara’ (White Carrara marble): c. 53.5%;
- ‘Marmo Venato’ (Veined marble): c. 24.8%;
- ‘Marmo Bardiglio’ (Bardiglio marble): c. 3%;
- ‘Marmo Nuvolato’ (Cloud-like marble): c. 1.5%;
- ‘Marmo Arabescato’ (Arabesque-like marble): c. 2.9% (+1.4% Brouillé variety);
- ‘Marmo Statuario’, ‘Statuario Venato’ (Statuary marble/Veined statuary): c. 4%;
- ‘Marmo Calacata’ (Calacata marble): c. 3.5%;
- Others c. 2.7% (including Marmo ‘Paonazzo’, Marmo ‘Zebrino’, ‘Cremo Delicato’, ‘Cremo Tirreno’, numerous Meta-breccias and the calc-schists ‘Cipollini’).

As a final remark, it should be emphasized once again that what is worldwide referred to simply as ‘Carrara Marble’ consists, in reality, of more than 200 varieties, each of which has been given a different commercial name. As is easily understandable, such a process has generated an almost uncontrolled proliferation of commercial definitions with the related difficulties in properly identifying each specific variety and/or selecting it.

**Area of occurrence**

*Carrara Marble* and all the related commercial varieties occur within the Apuan Alps region, northwestern Tuscany, Italy (Fig. 2). This region is approximately 30 km long and 12 km wide with marble outcrops useful for commercial purposes covering over 75 km².

**Principal location of quarries**

Marble quarrying activities throughout the entire Apuan Alps region are carried out in five main areas (Fig. 3):

- **Carrara area** (Western Apuan Alps – ‘C’ in Fig. 3): municipality of Carrara;
- **Massa area** (Western Apuan Alps – ‘M’ in Fig. 3): municipality of Massa;
- **Lunigiana area** (Northern Apuan Alps – ‘L’ in Fig. 3): municipality of Fivizzano;
- **Garfagnana area** (Northeastern Apuan Alps – ‘G’ in Fig. 3): municipalities of Vagli, Minucciano, Villa Collemandina;
- **Versilia area** (Southern Apuan Alps – ‘V’ in Fig. 3): municipalities of Stazzema, Seravezza.

All these areas take the global name of Carrara Marble District, although some of them are objectively at a distance from the Carrara basins *sensu stricto*.

**Carrara Area (Western Apuan Alps)**

It is a vast region, which develops altogether over an area of over 2000 hectares: it is divided morphologically into three deeply-set valleys separated from one another by the steep slopes of Mount Maggiore. These valleys, extending from the northeast to the southwest, correspond to the main marble extraction basins, which from west to east are Torano (with the sub-basin of Pescina-Boccanaglia), Miseglia-Fantiscritti and Colonnata, named after the three tiny quarrying villages en-sconced there. The currently active quarries in the whole Carrara area are 81.

The production of these basins is the highest (approximately 1 000 000 tons/year) of the entire Apuan Alps areas and accounts for more than 70% of the whole yearly marble production. This area is the one with the highest number of underground quarries in the world.

**Massa Area (Western Apuan Alps)**

The Massa area belongs entirely to the municipality of Massa: it covers a small territory and its basin is the least extensive of the Apuan Alps region. Its production, quantitatively limited,
comes from a dozen quarries, two of which are underground.

**Lunigiana Area (Northern Apuan Alps)**

This area corresponds to the north-northwestern part of the Apuan Alps and consists of various sub-basins, the most important of which are Monte Sagro and Equi. It has fewer than 10 quarries, producing approximately 100,000 tons/year.

**Garfagnana Area (Northeastern Apuan Alps)**

The Garfagnana area is located in the northeastern part of the Apuan Alps close to the villages of Gramolazzo, Minucciano and Ugliancaldo. It includes the Arnetola, Acqua Bianca, Orto di Donna, Boana and Vagli sub-basins with a total of about 20 quarries. The average yearly production is around 100,000 tons.

**Versilia Area (Southern Apuan Alps)**

In the Versilia area, the extractive activity is located in the Seravezza and Stazzema territories (Lucca province). In particular, the Mt. Altissimo sub-basin includes some important quarries (Cervaiole in the southeast and Cava La Buca in the east) that are noteworthy. There are approximately 15 active quarries with an overall yearly production of about 150,000 tons.

The marble formation is strongly characterized by the presence of the ‘Arabescati’ types, which in this area reach their maximum diffusion and variety. As far as the distribution and the occurrence of the various marble varieties is concerned, only the ‘Whites’, ‘Venati’, ‘Nuvolati’ and ‘Arabescati’ can be found (though in markedly diverse amounts) in every exploitation area of the Apuan Alps. Of particular note are the following:

- ‘White Carrara’ of good to very good quality is from all the localities and represents the bulk of the Apuan marble production as a whole. Noteworthy are:
  - the ‘Bianco P’, famous for the almost total absence of veins, today more or less totally worked out but, maybe, still with tiny bodies in the Carrara, Massa and Vagli (Garfagnana) areas;

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**Fig. 2.** Area of occurrence of the Apuan Alps marbles (Istituto Geografico De Agostini 1993; Meccheri et al. 2007).
some very homogeneous and fine-grained white from Carrara, Massa, Equi (Lunigiana), Gorfigliano (Lunigiana), Vagli (Garfagnana), Mt. Altissimo (Versilia) and Mt. Corchia (Versilia).

Because of their marked resemblance to the ‘White Carrara’, the ‘Venati’ are also diffusely present. A global distinction can be made between ‘Venato forte’ (heavy veined) and ‘Venato debole’ (light veined) sub-types, the difference being the major or minor (respectively) darkness, thickness and persistence of the vein framework crosscutting the whitish light-grey bulk rock. The ‘Venato debole’ type is quarried almost everywhere, and the whole production is comparable to that of the ‘White Carrara’, whilst the ‘Venato forte’ comes from some marble levels in the Orto di Donna (Gramolazzo, Lunigiana), Mt. Altissimo (Versilia) and Passo della Focolaccia (Gorfigliano–Garfagnana) districts (very rarely from other areas).

The ‘Nuvolati’ forms large bodies with no particular distribution inside the major ‘White Carrara’ and ‘Light Venati’ types (Carrara,
Massa, Seravezza (Versilia), Mt. Corchia (Versilia) and Panie group (Versilia)) or thick beds alternated with ‘White Carrara’ and ‘Heavy Veined’ levels (Orto di Donna (Lunigiana), Mt. Altissimo (Versilia) and Passo della Focolaccia (Massa)) to form a kind of well-developed primary stratification. Probably due to the low commercial request in the last fifteen to twenty years, the ‘Nuvolati’ production has been rather scarce.

- In contrast, the ‘Arabescati’ are intensely exploited in various areas, because they frequently combine decorative beauty with high-quality physical–mechanical features. Many kinds of the ‘Brouillé’ marble are extracted mostly in the three Carrara basins; the ‘Arabescati Arabesca’ comes from Vagli (Garfagnana); the ‘Arabesca Faniello’ comes from Arni (Versilia); the ‘Altissimo, Cervaiole’ and ‘Brec- cia Rio Serra’ are exploited in the southern Mt. Altissimo (Versilia); the ‘Arabescato Corchia’ comes from the quarries of the homonymous mountain (Versilia).

Regarding the other varieties:

- in the Carrara area the ‘Statuari’ and ‘Veined Statuari’ give the widest and most continuous levels, but interesting though scattered outliers are also present in the Massa area and in the Mt. Altissimo region (Versilia);
- the ‘Calacata’ types are almost all confined to the Carrara inland as well, but in other zones minor bodies are associated with the ‘Statuari’ or crop out as particular variations of local ‘Arabesca’, for example, the ‘Calacata Arnetola’ (Vagli — Garfagnana);
- conversely, the ‘Bardiglio’ and ‘Veined Bardigli’ are more regularly present in all the Apuan marbles and, though forming usually restricted lenses, they give locally important types among which the best known is the ‘Bardiglio Cappella’ near Seravezza (Versilia).

Apart from the ‘Arabesca’, ‘Calacata’ and ‘Ponazzo’ brecia-like marbles, other commercially important meta-brecias are provided by some horizons stratigraphically distinct from the Liassic Marble formation sensu stricto. They mainly occur in Seravezza inland, southern Apuan Alps (Versilia) — the Seravezza Breccia — and in the Arni (Versilia) and Arnetola (Vagli—Garfagnana) districts. They include marbles like the ‘Arabescato Maggi’, the ‘Brecia Rossa Arnetola’ and the ‘Arabesca Arni’.

Finally, the particular family of ‘Cipollini’, mainly represented by Cretaceous–Eocene calc-schists, mainly occurs in the districts of Gorfigliano (Garfagnana), Arnetola (Garfagnana) and Boana (Vagli—Garfagnana), Arni (Versilia) and Isola Sant’Anna (Versilia), and at Volegno (Versilia) in the southern Apuan Alps. The most classical example is probably the ‘Fantastico Arni’ from north of Arni village.

**Brief notes on the history of excavation**

The Carrara area is probably the sole area in the world where all the most important exploitation techniques, including the most rudimentary historical equipments, have been set up, tested, developed and exported to many other marble areas in the world. It can be objectively stated that the Carrara area has always been a school area or a training area not only for many other national districts but also for many worldwide operators. In light of this, it is here considered opportune to include a brief focus on the history of excavation.

The first sure data concerning exploitation of the marble deposits in the Apuan Alps (Carrara area) date back to the beginning of the 1st century BC when the Apuan region had already long been under Roman control. At that time the marble was called ‘lunense marble’, as the Apuan extraction centre was identified with the town of Luna. This was a Roman colony founded about a century before, from whose harbour the ‘naves lapidariae’ (stone ships) loaded with this precious material set sail for Rome. The remains of the Roman city can still be seen on the plains of the present-day Luni, about ten kilometres away from Carrara.

Ancient evidence regarding the use of the lunense marble for both public and private buildings in Rome indicates that at that time the extraction of marble must have already been carried out on an industrial scale. What is unsure is if it was really the Romans who first discovered the deposits. Perhaps the Apuan Ligurians, the people who inhabited the region before the Roman invasion, or the Etruscans, who certainly occupied at least the coastal strip of land, had already made use of the Apuan marble deposits. However, be that as it may, excavation was not as important as it was during Roman times.

In-depth studies have revealed the presence of numerous locations showing signs of ancient ‘cut-tings’ that can be attributed to the Roman Epoch. What proves that the Romans were well aware of the expanse of the Apuan deposits is the fact that these locations, which we can rightly say correspond to the same number of quarries or groups of quarries, are homogeneously distributed among the three marble basins exploited today (Torano, Miseglia-Fantiscritti, Colonnata). Moreover, they often corre- spond to quarries still in operation today too.

But, the cuttings are not the only findings. Apart from many tools used for excavation, pieces of
handwork, inscriptions and epigraphs have also been found in the exploitation areas. These show how the extraction activities were structured according to a well defined organization, which strongly resembled the extraction techniques in use in the Apuan quarries up to some decades ago.

Without machines to cut the rock, this operation had of course to be carried out by hand with the aid of a hammer and chisel, trying as now to take fullest advantage of the natural fractures and the rock faces with less mechanical resistance. This is how the ‘caesurae’, or rather the channels forming the main cuts into the mountain, were made ready for the separation of the blocks, which were then divided and cut into square shapes of a manageable size. The latter operations were carried out by making ‘formelle’, V-section cuts along the surfaces to be opened where iron plates were inserted. Iron wedges were placed between these plates, which were then hammered in until the channel opened up. Sometimes, in order to break the block away from the mountain, wooden wedges were inserted, which, once wet, increased in volume and so exerted the necessary pressure to break the rock. However, it remains uncertain whether this technique was really used by the Romans or whether the traces of its application visible on some findings should be attributed to decidedly more recent times.

An important conceptual difference, compared with more recent extraction techniques, is represented by the fact that the raw material was transformed into a semi-finished product in the quarry itself. On the one hand, this avoided the useless transport downhill of extra weight that would then have been eliminated in the processing stage: on the other hand, this meant that particular care was required when lowering the handwork, which was very much more fragile than the rough blocks. It is now been confirmed by various studies that the latter operation was carried out by the ‘lizzatura’ method (see Related heritage issues), used in the Apuan basins to lower the blocks downhill until about thirty years ago. Such a differentiation, as far as extraction activities are concerned, inevitably led to specialization of the workers, who were divided into different categories according to their different duties within the organization of a quarry. The ‘caesores’ took care of the main cuts into the mountain; the ‘quadratarii’ were assigned the job of squaring the blocks, a job that required a certain expertise in the use of the chisel; finally, the ‘maquinarii’ were responsible for lifting and transporting the blocks. All the quarry activities were led and supervised by the ‘magister ab marorisibus’, the equivalent of today’s quarryforeman.

Unfortunately it is impossible to estimate, even loosely, the extent of the extraction activities in the Roman Epoch. Nevertheless, the great quantity of Apuan marble used in Monumental Rome and, above all, the great number of types used, among which we find Statuario, White Carrara and Bardiglio, gives reason to suppose that the number of quarries was much higher than the number still in existence today. Important information has been passed on to us thanks to the writings of Giovenale who at the beginning of the 2nd century A.C. spoke of how the roads of Rome were invaded by carts carrying loads of lunense marble.

There does exist however an estimate regarding the number of people engaged in each Roman quarry. It is calculated that in a medium-sized quarry working at its maximum capacity there were about a hundred people in all, including both the workmen and the supervisors. This is an extremely significant figure especially when multiplied by the total number of quarries in existence. However, as is well known, at that time labour was extremely cheap and consequently prices were advantageous and continued to be so at least until the 4th century A.C. when the big economic crisis that hit the entire empire culminated in prohibition of the extraction of lunense marble.

There are no data concerning the exploitation of Apuan marbles for a very long time after Roman times. Moreover, at least until the 2nd century anyway, excavation, even if it was not completely interrupted, was probably of little importance.

Only towards the end of the 13th century, under the reign of Federico I, can it be said that extraction activities were resumed in the Carrara basins. At that time excavation techniques must have been much the same as those applied in Roman times. The operations were still carried out exclusively manually, and this was so at least until the 18th century when the first excavations using explosives, and in particular ‘black powder’, were carried out. Obviously, the use of explosives was immediately widely approved as it allowed for the breaking away of vast quantities of rock in a relatively short time. This technique making use of explosives was called ‘varata’ (blasting). Once the rock face to be knocked down had been established, one or more ‘mines’ were made. First of all, deep holes, or rather proper shafts in the rocky mass were made by hand; then, at the end of these shafts, with the aid of hydrochloric acid, chambers big enough to contain the necessary quantity of black powder were dug out. The explosion caused the breaking away of huge portions of mountain in irregular blocks that were then cut down, again manually, into saleable sizes. However, this technique had one big drawback in that it destroyed a great deal of good marble, and it produced an enormous quantity of waste material, which increased the size of the marble dumps out of all proportion. No new...
techniques to replace the destructive blasting system came to light until the end of 19th century.

In 1889, at the International Exhibition in Paris, a new system was presented that allowed for the cutting of marble with a helicoidal wire. In less than six years Carrara immediately adopted this new revolutionary system, which offered the great advantage of performing large cuts directly into the mountain face.

The performances, the versatility and the favourable economic aspects of this technology accelerated its diffusion in all the Carrara basins, making the helicoidal wire the top technology for more than 80 years, until the appearance of diamond wire (1978–1979). Since then, the last 35 years belong to the recent history of marble exploitation with the definitive adoption of diamond wire and its use together with the chain saw in a combination that provides the best results in terms of productivity, safety, quarry yield and versatility.

Geological age and geological setting

In the regional context of the inner northern Italian Apennines, the Apuan Alps is an uplifted and severely eroded region (the ‘Apuan core complex’; Carmignani & Kligfield 1990) in which the Tertiary fold-and-thrust structure of the Apennine chain is best exposed. The deepest part consists of the so-called Apuan Metamorphic Complex (AMC) that comprises the metamorphic sequences of the Massa Unit and the underlying Apuan Unit (*Autochtonous Auctorum*); the latter includes almost all of the ornamental stones of concern here and are identified under the general term ‘Carrara Marble’.

Upwards the AMC is followed by unmetamorphosed cover units; that is, the Tuscan Nappe, the Canetolo Unit, and some units from the Ligurian Domain named Liguride Units *sensu lato*.

The lithostratigraphic sequence of the Apuan Unit is formed by the following main groups of meta-sediments:

1. Middle–Late Triassic to Early–Middle Liassic meta-dolostones, dolomitic marbles and pure marbles;
2. Middle Liassic to Early Cretaceous cherty marbles, meta-cherts and calc-schists;
3. Early Cretaceous to Early Oligocene phyllites and meta-siltites, locally containing marble interlayers, calc-schists and lenses of meta-calcrenites;
4. Late Oligocene to very Early(? ) Miocene quartz-feldspathic micaceous meta-sandstone.

This sequence was deposited over a portion of the palaeo-African margin, and, during the Tertiary, both the Alpine cover and its pre-Alpine (Hercynian) basement were involved in the Alpine orogenesis through two, symmetamorphic, main tectonic events.

The first deformation phase (D1), active at the Oligocene–Miocene boundary (between about 30 My BP and 25 My BP) was compression related and caused the above-said tectonic units to pile up. The rocks of the Apuan Unit suffered severe deformation through development of a penetrative foliation (S1), axial planar to NE-facing, submillimetric to pluri-kilometric isoclinal folds coeval to green schist facies metamorphism. The evolution of this phase led to several laminations along the flanks of the folds, widespread elongate lineation parallel to the S1 (stretching of clasts, fossils, etc., boudinage, linear preferred orientation of metamorphic minerals) and an increasing development of shear geometry in the fold style passing from WSW to ENE.

The following tectonic phase (D2) began in Early Miocene (nearly 25 My BP) as a consequence of the tectonic regime’s inversion from compression to extension. This made the piled units progressively uplifted in junction, since Late Miocene, with the first openings of the eastern Ligurian and Tyrrhenian Seas. This uplift resulted in a large-scale positive structure (the Apuan ‘dome’) characterized by a very complicated internal geometry and a NW–SE lengthened shape.

The most frequent D2 structures are variously sized folds, with axial planar foliation (S2) accompanied by a green-schist facies blastesis, retrogressive with respect to the syn-late D1 imprinting. On the whole, these folds form staircase sets diverging from the main hinge zone of the regional megastucture toward both the SW and ENE along the SW and NE slopes of the ‘dome’. These folds are often related to several, ductile-to-ductile–brittle shear surfaces whose kinematics matches the vergence of the same folds.

During the final stages of the Apuan uplift, the extensional structures gradually changed from mainly ductile to brittle; that is, high angle normal faults trending both NW–SE and, less frequently, SW–NE.

The Ornamental Stones

The Apuan Alps provide various kinds of ornamental rocks such as pure and impure marbles, dolomitic marbles, meta-breccias, ‘cipollini’ and meta-sandstones. Since all these rocks are often generally identified as ‘Apuan marbles’, or erroneously ‘Carrara Marble’, it is worth specifying that:

- The marbles *sensu stricto* (s.s.; including pure, impure and dolomitic marbles) correspond to the Lower Liassic Marble s.s. formation of the Apuan Unit sequence.
Meta-breccias are meta-rudites principally pertaining to stratigraphic horizons older or younger than the Marbles s.s. but to some extent also to the latter (the ‘arabesque’ type, e.g.).

The ‘cipollini’ are calc-schists that form thick and persistent bodies corresponding to younger formations and a few thin levels also at the top of the Marble s.s. (‘Zebrino’, e.g.).

Finally, the Upper Oligocene flysch is exploited related to the alteration in-depth studies due to the fact that it is closely time but has only recently been the subject of marble varieties may have been known for a long context: it is the largest and the one with the highest number of active quarries.

The microstructural variability of the Apuan marble varieties may have been known for a long time but has only recently been the subject of in-depth studies due to the fact that it is closely related to the alteration/degradation of the materials and their behaviour in situ.

Petrographic name

Due to the petrographic variability of the different ‘Carrara’ Marble varieties, this paragraph reports the petrographic names of the seven main commercial varieties, as described in Commercial designations. Names are given according to the standard EN 12407:

(1) ‘Marmo Bianco Carrara’ (White Carrara marble), marble;
(2) ‘Marmo Venato’ (Veined marble), marble;
(3) ‘Marmo Bardiglio’ (Bardiglio marble), marble;
(4) ‘Marmo Nuvolato’ (Cloud-like marble), marble;
(5) ‘Marmo Arabescato’ (Arabesque-like marble), metamorphic breccia;
(6) ‘Marmo Statuario’ / ‘Statuario Venato’ (Statuary marble/Veined statuary), marble;
(7) ‘Marmo Calacata’ (Calacata marble), marble.

Primary colour(s) and aesthetics of stone

Making reference to the seven main commercial varieties listed in Commercial designations, the following primary colours and aesthetic of the ‘Carrara Marble’ can be identified:

‘Marmo Bianco Carrara’ (White Carrara marble): ‘Marmo Bianco Carrara’ ranges from white to a greyish colour with shaded grey veins in an irregular pattern. The three main varieties of White Carrara are classed according to the colour of the groundmass and are known as C, C/D and D. The C variety has a very light groundmass (almost white) with an even vein pattern that is not very marked; C/D varieties have a regular groundmass but not as white as the C variety, whereas the D variety also has a regular pattern but a darker, white-greyish groundmass.

‘Marmo Venato’ (Veined marble): ‘Marmo Venato’ has a groundmass varying in colour from white to grey with a clear evident pattern that is often oriented. Like White Carrara this variety can be classed either as C, C/D or D.

‘Marmo Bardiglio’ (Bardiglio marble) and ‘Marmo Nuvolato’ (Cloud-like marble): These marbles have fairly even dark-grey colour of the groundmass. Dark-grey and whitish vein patterns may be present or, in the Nuvolato variety typical of Carrara, irregular but oriented whitish-colour shades. The Imperial variety typical of Garfagnana area has an even grey – blue groundmass with no marked veins.

‘Marmo Arabescato’ (Arabesque-like marble): ‘Marmo Arabesco’ has white or grey (or other colour) groundmass with an irregular pattern of darker-colour veins that generally follow a preferential direction. Dominant colours of the vein are: intense grey (Arabesca Carrara, Arabesco Cervaiole, Arabesco Corchia), grey – dark greenish (Arabesca Faniello) and creamy-brownish (Arabesca Vagli).

‘Marmo Statuario’ / ‘Statuario Venato’ (Statuary marble/Veined statuary): These marbles have a pure white groundmass, verging on pale yellow-ish-ivory, that normally has no veins or some very shaded ones. Where the vein pattern is more frequent and evident (Statuario Venato), the colour of the veins is light to intense grey.

‘Marmo Calacata’ (Calacata marble): ‘Marmo Calacata’ has white–ivory-white saccharoid groundmass with soft, shaded grey, light-green to light-yellow veins. These veins sometimes form undulating bands that are more or less regular.

Natural variability

Refer to Commercial designations.

Composition

The Apuan marbles are carbonate rocks (limestone and minor dolostone), which re-crystallized under metamorphic conditions. Chemical analyses carried out on a wide range of different varieties (belonging mostly to the Carrara area) give 95–99 wt% CaCO₃. From a petrographical point of view, the following minerals can be found:

• Essential mineral: calcite;
Accessory minerals, more frequent: pyrite, muscovite, quartz, dolomite, opaque minerals (hematite, magnetite);
Accessory minerals, less frequent: sericite, epidote, titanite.

Because of its quite pure (CaCO₃ component) composition, the huge waste material of the ‘ravaneti’ constitutes a very important geo-resource. At Carrara there are several industries that work marble waste for calcium carbonate production (powder, 0–2 mm in size; granulated material 2–20 mm in size) and its use in other industries (paper, fillers, pharmacological products, painting etc.).

Technical properties

Values of the most significant technical properties for the seven commercial types illustrated in Commercial designations are reported in Table 1.

Suitability

Since its earlier history, the Carrara Marble has demonstrated technical properties that have made it suitable for any type of use and applications: building, decoration, architecture, sculpture, funerary art, urban landscape and, more recently, modern digital design. Historically speaking, in public areas the marble has been used practically everywhere, and for any purpose; cobbled pavements or streets paved with slabs made from elements laid edge to edge, sidewalks, pedestrians roads, and so on. The urban landscape and the common buildings have always taken advantage of its versatility; slabs for steps, balconies, skirtng, fountains, benches, and so on. The oldest buildings are built almost entirely of this marble; from walls to stairs, landings to balconies, terraces to ledges, lintels for doors and windows. In the interior it has been used for tables, kitchen-tops and stairs.

A relevant part of the reputation of Carrara Marble is indisputably linked to the name of famous sculpturers, artists and architects such as Michelangelo, Donatello, Jacopo Della Quercia, Canova, Bernini, and many others who decided to use this marble for their most important works. In this sense, although it is clear that the carving performance of a stone can effectively only be defined by actually carving/sculpting it, there has always been a global agreement on the excellent properties of the Carrara Marble. A unique mix of grain size, purity, texture and grains interlocking, accompanied by what is scientifically defined a saccharoid structure, give many varieties of Carrara Marble a top-level performance in sculpture works, particularly with some varieties such as Statuario, Statuario Venato, Bianco P and many others. As with other fine-grain marbles, it is also particularly suitable in applications where the translucency phenomenon is used.

Durability issues

As far as the durability is concerned, attention should be paid with some Carrara Marble types to the following phenomena:

(a) Granular disaggregation concerns the loss of cohesion in the marble, related to detachment of crystals. Such a phenomenon is known to occasionally occur exclusively in low–medium thickness elements installed outdoors and is mostly confined to White Carrara and Veined Marble commercial varieties.

(b) Bowing is the phenomenon in which the marble elements are affected by dimensional and geometrical instability: distortion of shape, bending out of shape and warping are the most common evidences. This phenomenon is reported to affect mostly low–medium thickness elements installed outside with dry systems (mechanical anchors). White Carrara and Veined Marble varieties appear to be the most vulnerable types. Both granular disaggregation and the bowing phenomena imply a loss of mechanical strength. These phenomena have been investigated in numerous projects for several decades, the largest one being the European project TEAM. Results of the TEAM project are nowadays incorporated in the European product standard for cladding (EN 1469) in order to limit as much as possible the inconvenience related to these phenomena.

(c) Discolouration refers to the tendency of some varieties (once again, above all White Carrara and Veined Marble) to, slowly but continuously, acquiring a yellowish-brownish-orange tone. The phenomenon, almost exclusively observed in floors (both indoor and outdoor), appears to be related to the interaction (oxidation) of iron-bearing minerals, dispersed in the marble mass, with the water (proceeding from screed, mortar, cementitious adhesives, atmospherics etc.). An extremely recent European standard (EN 16140) is now available to test the dimension stones for this possible inconvenience.

After saying that, it is of utmost importance to underline that these described phenomena are confined to some specific varieties, namely White Carrara and Veined Marble, and all those varieties that can be substantially assimilated to them. All the other commercial types perform well and have never been shown to be susceptible to these inconveniences.
Table 1. Some technical properties related to the seven main commercial varieties of Apuane Alps marbles

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<td>Water absorption at atmospheric pressure (EN 13755)</td>
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<td>0.12</td>
<td>0.17</td>
<td>0.15</td>
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<tr>
<td>Flexural strength in natural conditions (EN 12372)² MPa</td>
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<td>12.0</td>
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<td>Flexural strength after exposure to 48 frost cycles (EN 12372 + EN 12371)² MPa</td>
<td>20.3</td>
<td>9.6</td>
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<td>98.1</td>
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<td>86.8</td>
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<td>Slip resistance (honed finishing) – USRV value (EN 14231)</td>
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<td>63 (dry)</td>
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<td>63 (dry)</td>
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<td>33 (wet)</td>
<td>35 (wet)</td>
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*Source: The Tuscan Marble identities
†Fantiscritti locality (Carrara area)
‡Belgia, Gioia, La Piana localities (Carrara area)
§Carrara area
||Stazzema locality (Versilia area)
{|Ravaccione, Bettogli localities (Carrara area)
©Calocara, Bettogli localities (Carrara area)
|orientation of the specimen unknown

## Mean Values/Descriptions

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Vulnerability and maintenance of supply

A true assessment of the available marble reserves in the whole Apuan Alps region has never been done, but reliable estimates (from different sources), the evidence of the physical extension of the Marble Formation, and its thickness (over 1000 metres in some part of the Apuan Alps) allows one to state that the available reserves are sufficient for centuries and centuries.

Buildings and so on

The applications of Carrara Marble are so vast that it is objectively not easy to synthesize them in a satisfactory way. This is increasingly true when we direct our attention to the fields of sculpture and artistic works, being that innumerable examples of such applications are preserved in a large number of churches, museums, academies, temples and so on. The following list is therefore a non-exhaustive one, but it enumerates a selected number of extraordinary artworks together with a significant number of civil constructions.

Sculptures (chronological order)

- Temple of Apollo Palatinus (31–28 BC), Rome (Italy).
- Temple (Ara Pacis Augustae (13–9 BC), Campus Martius, Rome (Italy).
- Colossus of Constantine (c. 280–337), Palazzo dei Conservatori of the Musei Capitolini, Rome (Italy).
- Fonte Gaia fountain, (1346, restored 1859) Piazza del Campo, Siena (Italy).
- Ilaria del Carretto sepulchre (1408), Cathedral, Lucca (Italy).
- Michelangelo’s Pietà (1497–1499), Basilica di San Pietro (Vatican City).
- Michelangelo’s David (1501–1504), Academy Gallery, Florence (Italy).
- Michelangelo’s Pope Julius II tomb (1505–1543), Basilica San Pietro in Vincoli, Rome (Italy).
- Michelangelo’s Dying Slave (1513–1516), Louvre Museum, Paris (France).
- The rape of the Sabine women (1574–1580), Loggia dei Lanzi, Florence (Italy).
- Pluto and Proserpina (1621–1622), Galleria Borghese, Rome (Italy).
- Apollo and Dafne (1622–1625), Galleria Borghese, Rome (Italy).
- Bust of Cardinal Scipione Borghese (1632), Galleria Borghese, Rome (Italy).
- The Ecstasy of Saint Teresa (1647–1652), Capella Cornaro, Santa Maria della Vittoria church, Rome (Italy).
- The Ecstasy of Saint Teresa (1647–1652), Capella Cornaro, Santa Maria della Vittoria church, Rome (Italy).
- Marly Horse (1739–1745), Louvre Museum, Paris (France).
- Antonio Canova’s Paolina Borghese (1804–1808), Villa Borghese, Roma (Italy).
- Persephone (1844), Honolulu Museum of Art, Hawaii (U.S.A.).
- Eternal Springtime (1901), location unknown.
- King Edward VII Memorial (1913), Birmingham (UK).

Buildings (including Recent buildings)

(European order)

Europe (Mediterranean Area)

- Museo dei Fori Imperiali – Mercati di Traiano (46 BC–113 AD), Rome (Italy).
- Trajan’s Column (113 AD), Rome (Italy).
- Pantheon (126 AD), Rome (Italy).
- Miracle Square, Baptistere, Cathedral and Leaning Tower (1063–1362), Pisa (Italy).
- Cathedral, 12th century, Carrara (Italy).
- Cathedral (1215–1263), Siena (Italy).
- Santa Maria del Fiore Cathedral (1296), Florence (Italy).
- Robba Fountain, Ljubljana (Slovenia).
- Tripoli Auditorium (Libya).
- Palazzo dei Congressi, Paris (France).
- ‘Lingotto’ Fiat Building, Torino (Italy).
- Padre Pio Church, San Giovanni Rotondo (Foggia, Italy).
- Grand Arche, Paris (France).
- Esso-EUR Headquarters, Rome (Italy).
- L’Abeille Insurance Headquarters, Milano (Italy).
- Astrea Villa, Genova (Italy).
- Senate Palace, Paris (France).
- Chancellor’s Office of Japan, Paris (France).
- Bank of France, Montrouge (France).
- Bank of France, Clermont-Ferrand (France).
- U.R.S.S. Embassy, Paris (France).

Europe (non-Mediterranean Area)

- Marble Arch (1827), London (UK).
- Oslo Opera House, Oslo (Norway).
- Metro Bruxelles (Belgium).
- Alison Lapper Pregnant, Trafalgar square, London (UK).
- St. Petersburg Museum, Russia.
- Church of University Clinic, Innsbruck (Austria).
- Royal Palace, Warsaw (Poland).
- Terminal of the Liegi Underground (Belgium).
- Central Post, Stuttgart (Germany).

Americas

- Harvard Medical School Buildings, Boston, Massachusetts (USA).
The following issues are considered to be of relevant importance within the so-called ‘Carrara marble system’.

Civic Marble Museum

The Marble Museum was founded in 1982 for the purpose of collecting and documenting testimonials to local marble culture. It houses well-rounded collections devoted to Roman archeology, history of the area, marble samples, industrial archaeology, plaster models and modern sculptures.

It also has a library rich in texts on marble and local history. Recently added is a multimedia station showing films on the collections. The museum also has outdoor areas displaying artefacts too large for indoor exhibition. Among them are the cart of a steam-powered tractor for block hauling (19th century), a flatcar (1890), the last remaining of the marble railway, a steam-powered tractor converted to a rock crusher (1910), a loaded sled with annexed machinery for cutting with a helical wire, a 19th century gangsaw, and a tool extractor wheel from the same period as the gangsaw (1880).

Over the years, the museum has become the venue where the city’s historical legacy is enshrined, thus providing scholars with valuable material for their studies. It is divided into the following sections: Modern Sculpture, Vatteroni’s Donation, Roman Archaeology, Industrial Archaeology, Artifacts of the Cathedral, Artifacts for Icon, Technical Application, The Marble Gallery, History of the Territory, Temporary Exhibitions

The Fine Arts Academy

Devoted to people more interested in the historical–artistic viewpoint, in the 14th century arched courtyard of the building in which it is housed, the Academy exhibits an important collection of Roman marbles divided into three categories: figurative sculpture, religious and funerary monuments and architectural elements. Of particular worth is its collection of Luni (ancient Carrara) sculpture, with works like a man in a toga, a torso clad in armour, a statue of Leda, a statue of a woman with chiton and mantle, a torso of Minerva.

In addition to the Academy, artwork is featured at two recently founded institutions, the Carrara Artistic Marble Consortium (CMAC), and the Sculpture Museum. The CMAC, set up in 2004, is primarily concerned with maintaining and protecting Carrara’s artistic and cultural heritage: it promotes a trademark for marble to qualify the products traditionally made by local artisans from local marbles.

The Sculpture Museum, inaugurated during the 2006 Sculpture Biennial, is devoted to the world of sculpture as a whole; obviously with an emphasis on works in marble where Carrara materials reign supreme. The project is clearly designed to make Carrara a new Tuscan museum hub, thanks to possible synergies between the two Museums (Marble and Sculpture) and the Academy.

The Monticolo Pulley

In 1889 at the International Exposition of Paris, a revolutionary machine was presented, which cut marble blocks with a helicoidal wire (see also Brief Notes on The History of Excavation): it was invented and patented by the Belgian engineer Chevalier in 1854. Since 1895 it was used also in the marble quarries of Carrara where it became the dominant technology, acquiring, in the meanwhile, a considerable diffusion all over the world.

In 1897, in the quarries of the Carrara basins, an ingenious innovation was brought to this technology by engineer Monticolo. The innovation, the ‘penetrating pulley’, consisted of a device that considerably increased the cutting potential, because it was capable not only of carrying the wire for the cut but also of penetrating directly into the rock. This innovation gave a definitive solution to the insuperable problem of the so-called ‘blind cuts’.

The historical commemoration of the ‘lizzatura’

This commemoration takes place in the quarries in the basin of Colonnata (Carrara sensu stricto area), usually on the first Sunday of August every year:
it revives the marble carriage through the stone-boat, named ‘lizzatura’, an extremely dangerous operation which was used since ancient times.

The stone-boat was a kind of sled made with three big trunks put next to each other and shaped like skis: there was laid the blocks of marble (the ‘carica’), with a total weight of $15-20$ tons. In order to carry the blocks down the mountainside, the stone-boat was driven along the ‘vie di Lizza’ (the stone-boating road, a kind of purpose-built roadbed) or, more frequently, it was lowered down the ‘ravaneti’ (huge waste deposits, today part of the local landscape) covering the downwards slope of the quarries. The stone-boat was kept by three big ropes partially coiled around the ‘piri’ (i.e. logs driven into the marble ground): the ropes were loosened slowly while a group of workers (sled men named ‘lizzatori’) laid before the stone boat a series of wood sleepers, named ‘parati’. The job took 16 or 17 men, under the direction of the Capolizza.

The ‘Lizzatura’ was a tricky, dangerous ballet on steep slopes with uncertain footing, which depended upon timing and teamwork. As a matter of fact, the Capolizza decided the path and guided the sled, but the actual steering was the job of the ‘mollatori’ who would increase the slack on one of the ropes that kept the sled from careening down the hill, thus allowing the runners to turn in the other direction.

Usually, this historical commemoration is closed at the end of the morning with the bacon-fat tasting (‘lardo of Colonnata’), which is characteristic of the village and is produced in the typical workshops famous all over the world.

The ‘ferrovia marmifera’ (the marble railway)

Due to the dangerousness of the ‘Lizzatura’ system of transportation, many efforts were done to replace it. The most important step forward was made with the building of the Ferrovia Marmifera (The Marble Railway), inaugurated on 19 August 1876. The first trip was done 16 years later, in 1892. Once completed, the marble railway covered a distance of more than $20$ km, with 16 bridges – the Ponti di Vara – and a series of 15 tunnels. It had $10500$ more metres of secondary lines leading to sawmills and workshops.

The Marble Railway has been a real masterpiece of engineering that astonished Europe, if we consider not only the time of construction, but also the descent to overcome ($450$ m) and various structural challenges. Unfortunately, after World War Two and its economic consequences, the railway proved uneconomical and the municipality decided to stop it in 1963. Now that the marble railway no longer exists, its track and one part of the tunnels have been inherited by powerful modern trucks representing, at the moment, the only way of transport of marble blocks.

In the lower portion of the Miseglia-Fantiscritti basin, the famous Ponti di Vara is not only a stereotyped view of Carrara quarries, but also the more visible testimonials of the old Marble Railway.

The monolith of Carbonera quarry

In the Miseglia basin (Carrara area) the quarry of Carbonera has become famous for a memorable event unique in the history of excavation of Apuan Alps marbles. In 1928, with the helical wire, a perfectly integral block of marble was extracted from this quarry, deprived of any defect whatsoever and of an incredible size. It in fact measured $18$ m in length by $2.35$ m in width and the same in height, and it weighed around $300$ tons. The enormous block, rightly named ‘monolith’, was destined to become the obelisk of the ‘Mussolini Forum’ in Rome, where it stands to this day, and its transport to this destination represented an epic task especially when one considers the methods of transport in use at that time. Initially, the monolith was completely ‘caged up’ in a structure made of wood and iron, which weighed $64$ tons, and taken down with the ‘Lizzatura’ system with the help of $25$ steel cables. From the bottom of the mountain, still on the ‘lizza’, it was drawn by more than $30$ pairs of oxen to the port, ready to be embarked on a purpose-built barge. To cover the $11$ km from the quarry to the port it took $8$ months of extremely hard work, and to facilitate the advancing of the ‘lizza’ on the wooden sleepers, it supposedly required a good $70000$ litres of soap.

The Carrara MARMOTEC fair

The Carrara MARMOTEC is one of the oldest international fairs in the worldwide sector of dimension stones and one of the two reference fairs in Italy; the other being MARMOMACC in Verona. For 32 years it has represented a primary appointment for all the operators linked to the natural stone sector such as traders, professionals, manufacturers of equipment, tools and plants, architects, designers and buyers and a key event to follow the latest tendencies on the natural stone industry in a place still considered as the world capital of marble.

The fair is organized by Internazionale Marmi & Macchine (IMM), a company established in 1978 whose activities include promotion, analysis of market trends, technology transfer, project research and consultancy involving the stone industry on an international scale. Among its numerous initiatives, flagship issues are represented by the Awards (Marble Architectural Awards; Dressed Stone Design Awards; Design Technology Awards) and
the Stone Sectors, and a yearly book edited by IMM is published containing updated and detailed statistics about the world’s stone market. The fair takes place every two years in the Fair Complex of Marina di Carrara, which covers an area of 95 000 square metres, including 34 000 indoors.

Other designations

Taking into consideration the relevant historical, commercial, technical, architectural and social role played by the Carrara Marble, it is here proposed the additional designation of ‘Global Ornamental Stone’.

Principal literature related to the designated stone


References


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