

MD Journal
[Dossier]

MARMO
MEETS
ACADEMIES
Advanced research, lithic experimentation

Giuseppe Fallacara
Dossier editor

Essays

Alfonso Acocella, Alessandro Angione,
Christophe Aubertin, Ilaria Cavaliere,
Dario Costantino, Giuseppe Fallacara,
Katia Gasparini, Sergio Musmeci,
Antonio Leone, Isabella Leone,
Paolo Musmeci, Luigi Prestinenzza Puglisi

[This *MD Journal* supplement is supported by Marmomac and Veronafiere in relation to a vision of corporate social responsibility towards university research as a lever of growth and stimulus to innovation.]

MARMOMAC
BEST STONE TRADE SHOW



MD Journal [Dossier]

Supplement to the scientific journal *MD Journal*
founded in 2016



The images used in the journal comply with the practice of fair use (Copyright Act 17 U.S.C. 107) implemented in Italy by Article 70 of the Copyright Law, which allows them to be used for the purposes of criticism, teaching and scientific research for non-commercial purposes.

Scientific Direction
Alfonso Acocella, Veronica Dal Buono, Dario Scodeller

Editorial staff
Annalisa Di Roma, Graziana Florio, Eleonora Trivellin

Art direction
Giulia Pellegrini

Promoter
Research laboratory Material Design, Media MD
Department of Architecture, University of Ferrara
Via della Ghiara 36, 44121 Ferrara
www.materialdesign.it

ISBN 9788885885196

MARMOMAC MEETS ACADEMIES

Advanced research, lithic experimentation

Catalogue of the exhibition,
Verona, September 26th-29th, 2023

Exhibition curator
Giuseppe Fallacara

Collaborators
Alessandro Angione, Ilaria Cavaliere, Dario Costantino

Technical support
Katia Gasparini

Stone may represent the future of architecture.
Claudio d'Amato Guerrieri

MD Journal [Dossier]

Table of contents

- 6 **MMA. Marmomac meets Academies**
Federico Bricolo
- 8 **The style of stone**
Alfonso Acocella
- 22 **An ad hoc culture**
Luigi Prestinzenza Puglisi
- 26 **Sergio Musmeci**
Paolo Musmeci. Research beyond the science
- 30 **Marble waste cannot exist**
Antonio Leone, Isabella Leone
- 34 **From arch to architecture**
Christophe Aubertin
- 40 **Advanced research, lithic experimentation**
Giuseppe Fallacara
- 46 **Lithic modularity**
Katia Gasparini
- 50 **The practical approach**
Alessandro Angione, Ilaria Cavaliere, Dario Costantino
- 54 **Prototypes**



Marmomac meets Academies

Federico Bricolo

President of Veronafiere

Natural stone has always played an important role in human history: it was widely used to make the first tools and then in art and architecture, through to today's highly innovative experiments in the design field. Marmomac – the most important global trade fair dedicated to marble and the natural stone supply chain – has accompanied and supported evolution in this sector as its preferential interpreter for 57 editions. Business, exceptional internationality, promotion of product culture and professional training are the key factors of its unique trade fair format. Marmomac benefits from Veronafiere's skills as a leading organiser of trade events as well as input from the entire community associated with the world of natural stone. All this is achieved thanks to the specific characteristics of our local area – home to one of the oldest marble districts in Europe active since Roman times. Consequently, Marmomac expresses an historically vocational province as regards working marble and developing related processing technologies that today are the state of the art in terms of machinery and accessories. This highlights the virtuous circle established when a strong manufacturing sector, combined with creativity, inventiveness and technique, joins forces with a brand such as Marmomac and its team work skills to create added value for the development of the entire marble-natural stone system. Such growth, however, would no longer be possible today without another equally fundamental component: innovation.

Research and experiments are vital in outlining and then following new paths: this is why we have decided to make significant investments in projects such as *Marmomac Meets Academy* to involve Italian and international academia at the trade fair. Our mission as organisers of trade fairs is by no means limited to promoting business meetings on stands but especially seeks to promote knowledge of the qualities of natural stone, encourage its use at all levels and ensure that architects, designers and planners are its first ambassadors with decision-makers, thereby helping to generate an increasingly dynamic market. At the same time, we are keen to inspire the world of research to be increasingly more daring, to explore and discover new languages and ideas involving stone materials in their infinite aesthetic and application potential. Experience in recent years has demonstrated how connection and dialogue between universities, academies and companies has proven to be extremely successful in the natural stone world and it is equally thanks to initiatives such as *Marmomac Meets Academies* that more architecture and design lecturers than ever are introducing marble in their teaching programmes; on the other hand, companies are also showing more interest in university research. This project helps new generations come into contact with natural stone, get to know and rework it with new shapes and meanings: the works highlighted in this catalogues are emblematic examples. Enjoy!

The style of stone

Archetypal elements, replications and innovations

Alfonso Acocella

University of Ferrara, Department of Architecture

«Style is the constant form
– and sometimes the constant elements,
qualities and expression –
in the art of an individual or a group».
Meyer Schapiro, *Style*, 1953

Elements, qualities and expression

Reflecting several times on the concise and metaphorical definition of *style* formulated by Meyer Schapiro [1], I always promised myself to look into what the *elements*, *qualities* and *expression* might be for what I have long loved to define as the *style of stone*; that is, the set of common characteristics and fundamental principles which – in times and places very distant from each other – have nurtured the notion of style and ultimately created an uninterrupted tradition, albeit through continuous renewal in the use of material, thereby establishing a system of relationships that is never fixed or taken for granted.

Elements. Among those *elements* which have characterised the style of stone from its origins, we can include a series of families of shapes that act as an *index* or reference repertoire.

These are very branched and internally differentiated classes (or families) of shapes that derive from known

archetypal elements – cumulus, monolith, wall, column, pillar, architrave, arch, vault, surface, membrane. We are aware of them today and of their existence mainly through the large mass of replicas, or rather “that entire complex of duplications, reproductions, copies, reductions, transpositions and derivations” [2] laid down following codification of an initial archetype and its variants that followed each other over the centuries.

Each formal class is the outcome of the accumulation of inter-linked solutions which have propagated from the original imprint along many branches (some now even *dead* or, rather, *frozen* always expecting for possible resumptions) and always registered within the formal family of reference. This reproduction is the result of multiple generations, the work of creators in most cases directed towards replicating solutions already found for specific problems, more episodically towards the search for new forms capable of expanding variety within the same formal class.

Bear in mind that the foregoing comments about *archetypal elements* in stone – mounds, monoliths, walls, columns ... etc. – took universal and eternal abstract entities as their generative imprint (i.e. *shapes*), not the univocal prerogative of the Style of Stone; ideal forms of the spirit – the fruit of theory, geometry and numbers – the result of man’s cognitive and creative abilities.

In other words, we want to emphasise how *form* (abstract) and *matter* (solid) – in our specific case represented by the amorphous lithological universe of natural stones as the concrete substance of the style of stone – belong to two distinct worlds. Vilém Flusser suggested that “matter is a temporary filler of eternal forms” [3].

Even stone itself - used to “fill out” immaterial forms - cannot escape *temporariness* since it is also subject, albeit in the extremely long term, to the weathering action of Time and inevitably destined to become ruins, vestiges, rubble, and – just as inevitably – return to its original amorphous state.

Forms will always remain beyond matter.

Quality. The archetypal elements understood as an index, a canonical repertoire of abstract forms of the style of stone, need – if they are to live beyond the world of ideas and spirit – actions and external activities that lead them to occupy space, to embody themselves.

It is in the physical world that the meeting and alchemical interaction between the forms and mineral body of the stone material and its specific features (size, consistency, granulometry, colour, response to processing, durability,



etc.) take place, which can be assessed as latent potential or *formal vocation*.

As soon as we cast our gaze on the universe of stone – as vast and immense as the world itself – we immediately realize that we are not faced by just one matter but, rather, by multiple, endlessly numerous materials; almost beyond classification in terms of vastness and variety.

Some special features (such as *quality*) clearly stand out however from the others.

The first concerns the *measurements* defining the *body*, that is, the dimensions available for embodying abstract forms. In this context, stone material is available in micro to macro dimensions, through the irregular configurations found in Nature as well as those defined by human artifice: flakes, pebbles, boulders, tesserae, slabs and ashlar, through to monoliths of monumental mass and scale; we know how form itself changes its impact and value in architecture depending on how scale is implemented.

What can be said about chromatic *varieties* (as well as patterns and granulometry) of the natural stone universe? A spectacular range of colours, lying motionless and hidden under the earth's crust. It is only through quarrying and processing that the colours of stone materials become evident, alive and vocal; in particular, the lustre of the most highly-prized stone materials, the shine of their skins, that

Lithothèque,
1763, Museum
of Palazzo
Schifanoia,
Ferrara

highlight surface colours often embellished with textures, veins, markings, swirls and reverberating light.

Colours that, in the vast variety of shades, identify the very nature of natural stone, marble, granite, travertine, alabaster and onyx; colours that are not ephemeral and artificial but stable and durable, encapsulated in the depth of the material.

Yet how many colours are there in the Style of Stone?

A multitude so huge and varied that it would be impossible to classify, name or describe them in full; the commercial categories organized in chromatic groups are more pragmatic: white, black, grey, beige, yellow, red, brown and blue.

We have spoken extensively elsewhere about the enchantment of colours, this “informal” quality – or perhaps “particular form” of the Style of Stone as such, when discussing the *admiration* and *varieties* evoked in Antiquity [4].

It is the artifice of honing and polishing the *material* that helps colours shine on the surface of stone, together with a multiplicity of patterns: uniform, veined, brecciated, cloudy, spotted, arabesque, speckled, mottled etc. An overflowing of patterns are also a *quality* of stone material. The *varieties* of colour and pattern are joined by other artifices applied to the body of stone materials by workshop tools to obtain different and wide-ranging visual impacts; even these “renderings” of the surface, these particular interpretations of matter, can be considered as a special *quality* – albeit eminently only on the surface – which distinguishes the expression of the style of stone; the long list these processes is worth mentioning in the footnote [5].



Lithothèque,
1763, Museum
of Palazzo
Schifanoia,
Ferrara

Expression. Having attempted to define briefly what the expression of the Style of Stone comprises, we can only indicate it as the alchemical result of the fusion of the two worlds we have evoked: the abstract world of forms and the physical world (made up of body, colour and dimensions) of stone matter.

In contributing to the expression of the style of stone, the variegated universe of stone materials – natural stone, marble, granite, breccia, travertine, alabaster, onyx, etc. – over time, a particular and multifaceted material has become available capable of driving, in an ambivalent manner, not only the concept of massive constructions with archetypal elements playing a structural role but also “slim” integument, in the form of “precious garments” that emphasise the aesthetic value of many varieties of stone. Briefly, the style of stone is an expression of *two-faced nature*, where the formal classes of an opposing character face each other almost as if in competition: stereometric shapes *vs* tectonics, plastic *vs* coplanar; massive *vs* slim; heavy *vs* light; continuous *vs* discontinuous; monochromatic *vs* polychromatic.

Replications and variations

Staying with the topic of the classes and formal sequences of the style of stone, it is important first of all to highlight how it is always difficult to identify the beginnings (i.e. the “objects” and the “first works”, the “auroral moments” as Kubler defines them) when stone was embodied in the fundamental original archetypes that laid down the timeless foundations of the Style.

The visible data we can see – the only information that can be investigated historically – are above all the intermediate solutions of the various formal classes developed specifically to resolve, in the flux of time, the problems that every architectural work poses; these ad hoc solutions allow us to glimpse an uninterrupted sequence and concatenation – albeit with caesuras, innovations and revivals – of the formal class to which they belong.

Works and formal responses that face each other and always linked as if by watermarks with each other, by that strength of resemblance and cohesion that the *essence* of the archetypal element of the family of forms constantly infuses.

Yet the very action of replicating already known and tested solutions should not be interpreted as a *copy*; any replica – especially in architecture – implies a transposition of the reference elements, their adaptation (not only dimensional) to the specific site and potential



use of different stone materials; ultimately, compared to every antecedent and every reference model, something is inevitably lost and, at the same time, something different (if not new) is gained.

The result, in the cumulative concatenation of the mass of replications, is that of slow, progressive variations of already codified solutions and – consequently – enhancement of the pertinent formal class.

Innovation and renaissance

We can see, in the current affairs of the last two decades, the phenomenon whereby “dormant” formal sequences – considered closed or at least firm and frozen in the conventional solutions of the past – suddenly and unexpectedly find themselves luxuriously *born again*, confirming George Kubler’s thesis: «No formal sequence can be considered definitively closed because all its possibilities in a linked series of solutions have been exhausted. The reappearance of old problems in new circumstances is always possible and at times even very up to date» [6].

An initial horizon of innovation in the style of stone includes the research and prototyping of new solutions

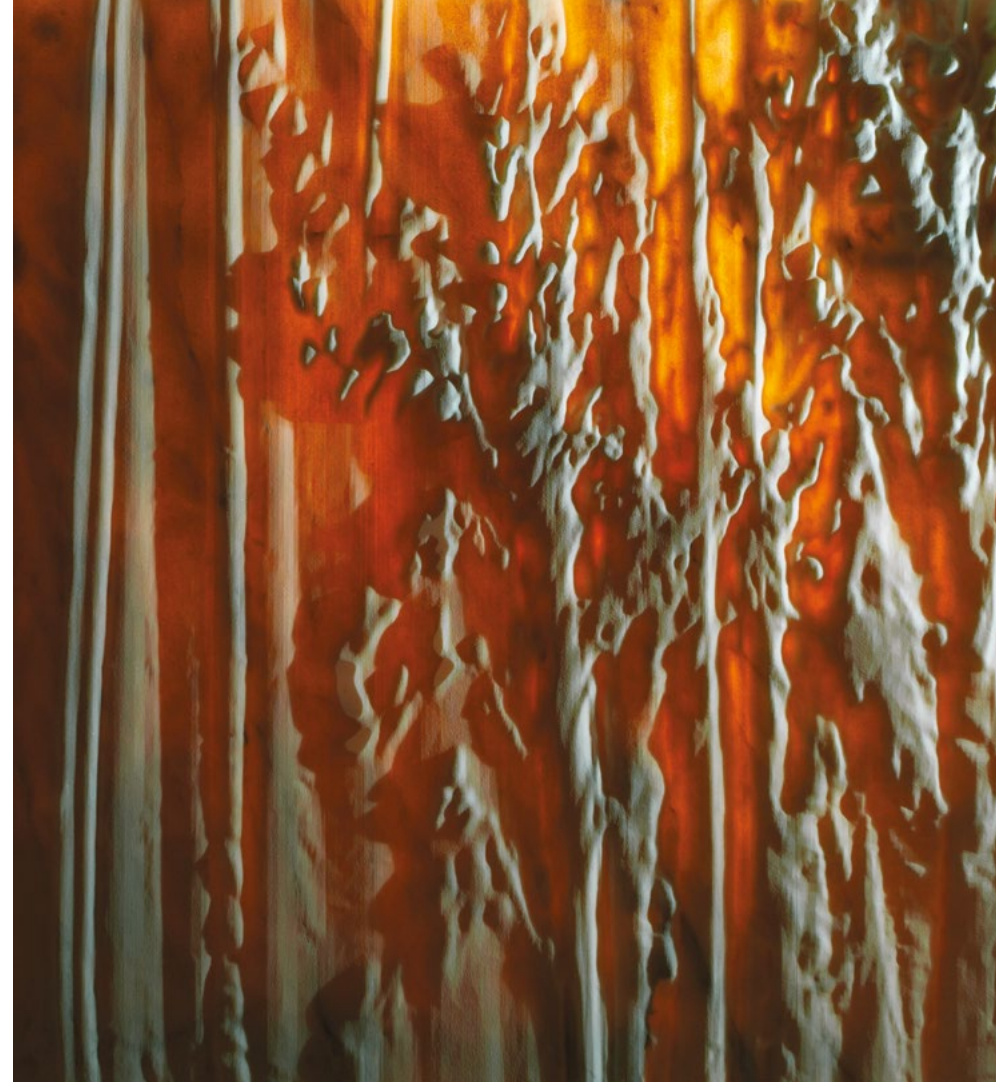
Corolla,
R. Galiotto

involving the formal class of *surfaces* and *surface-membranes*, thanks to the potential of robot-controlled machinery and above all new creative ideas among designers, who saw Raffaello Galiotto as the forerunner of such research in Italy and, equally, one of its main exponents [7].

Faced with conventional reference models – frozen for some time in two-dimensional and coplanar solutions, a legacy of the Modern Movement tradition and the offspring of mass production cutting-honing processes – over the last few years we have witnessed the definition of a varied panorama of new assembly and modelling devices, at times even very thick, developed in three dimensional stone material; modelling of continuous or diaphragm surfaces with evocative and intriguing shapes, never seen until now.

Inasmuch, *measurements* and *varieties* of matter (having three-dimensional mass, granulometry, a multiplicity of colours, designs, veins and translucencies) give rise to new families of shapes and stone surfaces from the inventive impulse and sculpting-modelling potential of computer-controlled robotics: volumetric-geometric, rough-corrugated, flat-coplanar, flat-lowered, fluid-flexible, colour-sign, luminous-translucent, porous (i.e. discontinuous), film-functional and even multi-material. A second horizon of innovation is associated with the recent resumption – although we could perhaps speak of an authentic renaissance – of *stereotomy* and the formal class of *stone vaults*, considered for more than a century to be an obsolete and out of date typology in terms of construction suitability using stone elements.

Even for this research area, *technique* (or rather *integrated techniques*) act as an initial activator. On the other hand, the notion of *technique* has always been associated with the notion of *matter*; technique as an ambivalent imprint acting along the metamorphosis



From the left:
Proto, Leucon,
R. Galiotto

that transforms *matter* into *material*, which in turn imposes restrictions and offers opportunities for forms in relation to production methods and the different types of machinery and tools used.

What has happened in the last two decades is epoch-making with the development and success of CAD (Computer Aided Design) and CAM (Computer Aided Manufacturing) systems which – among the many innovative driving forces in various production sectors – have also impacted the “dry branch” of stereotomy, especially the area linked with vaulted spatial

Luce Materia,
R. Galiotto



SNBR S
Bureaux,
Hypargate
G. Fallacara.
Ph. G. Bianco

structures, reactivating a cognitive interest in the pre-industrial tradition as well as unprecedented research and experimentation [8].

The technical-IT innovation has simultaneously impacted the entire process of architectural work which, from the conception, design and representation of general and detailed forms analysed by computers (such as modelling components, connective devices and special nodes) and has since moved seamlessly thanks to IT systems into factory production to cut stone elements with CNC machine tools using terminal tools (cutters/blades) capable of operating in the three dimensions of the work space with gradual and progressive removal of material starting from an unhewn block of stone.

The qualitative action of the computer-controlled sculpting operations is linked to the precise match with the design intention, the executive precision of the work of the cutting devices, the possibility of producing repetitive stone components even having complex geometry on a small scale, together with unique elements of variable shapes.

The versatility and operational pervasiveness of CAD/CAM systems has consequently re-opened the horizon for stereometry on new conceptual and production bases. The design and prototyping of structural stone vaults has now taken on special interest and liveliness, particularly in various European centres and workshops. It taken up as a preferential – albeit not unique – field of research by Giuseppe Fallacara who, over the last two decades, has developed numerous projects for stone vaulted spaces accompanied by the creation of full-scale prototypes; among the most recent: *Hipar Vault* (2017), *Flux Vault* (2017-2018) [9].

The nature of innovation: devices and works

Innovation can be identified as an inventive act – the result of personalities inspired by an inner drive, an urgency to create and experiment – with the aim of overcoming, if not breaking away from what is already known and existing.

In order to move from the abstract dimension of ideas and mental concepts to the application dimension, the innovative act always needs a summary, a *design* as well as a *project*, which makes it “visible” and “shareable” with other stakeholders, at the same time as allowing its materialization as an effective experimentation that can be subjected to evaluation and even criticism. Research, schemes and prototype tests take place in the experimental

phase, the latter item being the foundation for the implementation and success of the innovation itself.

This is the case for the numerous prototypes we mentioned earlier in relation to new formulations of *three-dimensional surfaces* or *stereometric vaults*. Stone devices – with eminently demonstrative and strategic meanings and objectives – tending to come forward and establish themselves as activators of new formal families; heterogeneous devices which include and merge form, matter and nodes, within a broader “fabric”.

Ultimately, these devices have an operational value, conceived as “laboratory tests”, whose main purpose is to establish their roles by intercepting and capturing the attention of people interested in this topic.

As evocative and attractive as they are, in their potential to open up the style of stone to a new universe of forms, the prototypes must wait for applications in architecture, the true and tangible testimony capable of establishing the ingenuity and innovation that these prototypes propose and put forward.

The work of architecture is the main active, dynamic and updating element of the style of stone; it is no coincidence that each Style has always been summarized and narrated through the line reconnecting with the “high peaks” of the sublime works.

Hypar Vault,
G. Fallacara



Tradition and innovation

In the eternal dialectic between permanence and change that we have sought to recognize within the development of the Style of Stone, we must ask ourselves – ultimately – what role is played by every inventive device and every innovative work beyond the fleeting historical moment (i.e. the moment of their *actuality*) when which they seem to be part of a trajectory outside tradition.

Soon the actuality that consolidated its appearance will be absorbed by the meshes of time, inevitably becoming, in turn, an integral part of the past.

Paul Schmitthenner’s masterful synthesis of this ambivalence gives us an interpretation of tradition not as a *entity frozen* once and for all at a certain date but as an *activity* undergoing continuous development within which innovation (what is new, in general) represents the active, dynamic and enriching part before then itself becoming part of tradition: «Man clings firmly to what he is used to and his habits until need, knowledge, innate abilities and practice transform what is usual and handed down over the generations. Knowledge and experience pass on by word of mouth, from hand to hand. And in this transition, often almost inadvertently, a part of the old is lost and something new appears. Yet the new that appears always grows on the groundwork of the old. If what is new is better, then progress is achieved. Progress, as a natural transformation of life, not change for change’s sake, but transformation that follows a natural course.

Hypar Vault,
G. Fallacara



Seen in this way, customs, traditions and progress are not opposed to each other but linked in a relationship of cause and effect. Custom offers a resistance, an obstacle that regulates the flow of events if it is too rapid; tradition is the force that ensures the flow; progress reveals the level of development achieved. However, the new that is formed within a continuously progressing tradition in turn becomes customary: its duration and validity depend on the force that it embodies. Tradition is therefore not a state but an activity, a continuous development and not merely a passive assumption» [10].

NOTES

[1] Meyer Schapiro – *Style*, Rome, Donzelli, 1995 (original edition 1953). The *style* quote after the main title is on page 3.

[2] George Kubler, *The shape of time*, Turin, Einaudi, 1976 (original edition, 1972), page 182. The quote is on page 50. Kubler himself introduces us to the eternal human dialectic between the

Flux Vault,
G. Fallacara,
M. Barberio

instinct to repeat known things and the impulse to create something new: «At every instant, human desires are different between replication and invention, between the desire to return to known schemes and that of escaping from them through a new variation. In general, the desire to repeat the past has always prevailed over the impulse to break away from it. There are never completely new actions, nor is it ever possible to perform an action without some variation. In every act, keeping faith with the model and breaking away from it are always inextricably merged». The quote is on page 88.

[3] Vilém Flusser, “Form and matter”, pages 7-16 in *Design Philosophy*, Milan, Mondadori, 2003 (original edition 1993) page 153. The quote is on page 8.

[4] Alfonso Acocella, “Materia”, pages 589-613 in *Stone Architecture*, Florence, Alinea, 2004, p. 604.

[5] Splitting, roughing out, chiselling, cutting, bush-hammering, scoring, dotting, corrugation, engraving, scratching, flame-finishing, sand-blasting, water jet processes, brushing, satin finishing, lapping, etching, lamination, patination and antique finishing.

[6] George Kubler, *op. cit.* The quote is on page 56.

[7] The contributions and development of Raffaello Galiotto's stone design – including artefacts, furnishing accessories and stone surfaces – can be traced through a series of publications linked with exhibitions and prototypes hosted at Marmomacc in Verona: Chiampo Marble Consortium, *Palladio and stone design. Raffaello Galiotto – designer –*, Vicenza, Campisi, 2008, page 106; Chiampo Marble Consortium, *The marble works of the Doge*, Vicenza, Campisi, 2009, page 122. Raffaello Galiotto, *Light and matter*, s.l.s. edition 2011, page 98; Veronica Dal Buono, *Raffaello Galiotto. Digital design and stone materiality*, Melfi, Libria, 2012, page 96; Raffaello Galiotto, *Experiments in stone design Marmo 4.0*, Venice, Marsilio, 2017, page 224; *Raffaello Galiotto, Next Creatures*, Milan, Electa, 2023, page 110.

[8] Francesco Defilippis, *Architecture and stereotomy*, Bari, PolibaPress, 2010, page 188.

[9] For an in-depth analysis of Giuseppe Fallacara's theoretical and application contributions in the field of stone stereometry, see: Claudio D'Amato, Giuseppe Fallacara, “Tradition and innovation in architectural design: role of the model and relevance of stereotomy” pages 52-89 in *The art of stereotomy*, Paris, Librairie du Compagnonnage, 2005, page 124; Giuseppe Fallacara, *Re-composed stereotomy*, Rome, Arachne, 2012, page 226; Giuseppe Fallacara, Marco Stigliano, *New Fundamentals of Natural Architecture*, Rome, Arachne, 2014, page 122; Giuseppe Fallacara, *Stereotomy 2.0 and Digital Construction Tools*, Paris, Librairie du Compagnonnage, 2014, page 96; Giuseppe Fallacara, Marco Ferrero, Vincenzo Minenna: “New stereotomic vaulted systems, Design project, calculation and construction, Maglie, Edizioni Gioffreda, 2015, page 128.

[10] Paul Schmitthenner “Custom, tradition and progress in the art of building” in Elisabeth Schmitthenner (ed.), *Paul Schmitthenner. Built form*, Milan, Electa, 1984, page 178. The quote is on page 33. The writing conceived immediately after the war from which the quotation is taken was only published posthumously in 1984 on the occasion of the centenary of his birth.